# Installation and Operating Manual

# Merlin 5064 V3

System Manager

**Please observe the safety instructions and read through this manual carefully before commissioning the equipment.**

# Safety information

## Power connection regulations

Please note the connection conditions specified by your local electrical power supply utility and the VDE regulations.
Your heating control system may be installed and serviced only by appropriately authorised specialists.

⚠ For fixed devices, a facility for mains disconnection in accordance with EN 60335 must be installed in compliance with the installation specifications (e.g. switch).

⚠ The mains lines insulation must be protected against damage caused by overheating (e.g. insulation hose).

⚠ The minimum distance to installation objects in the vicinity must be chosen so that the permitted ambient temperature is not exceed during operation (see table - Technical Data).

⚠ If the system is not installed properly, persons using it are at put at risk of fatal or serious injury (electric shock).
Ensure the controller is de-energized prior to performing any work on the controller!

## Warranty conditions

If the system is not installed, commissioned, serviced and repaired professionally, this will render the manufacturer's warranty null and void.

## Important text passages

**!** Important information is highlighted with an exclamation mark.

⚠ This attention symbol indicates dangerous situations.

## Note

**!** The operating manual describes the maximum version of the controller, meaning that not all statements are relevant for your device.

**!** The hydraulic diagrams contained in these operating and installation instructions are schematic diagrams. They are designed to assist you in selecting the correct program, and in no way describe or replace system planning according to good professional practice; for this reason, it cannot be guaranteed that systems built on the basis of a ono-to-one copy of these diagrams will function correctly!

## General Notes

**!** With regard to installation, operation, and maintenance, the following instructions must be observed. This device must only be installed by a specialist technician. Improperly performed repairs can subject users to considerable risks.

**!** To comply with applicable regulations, the instructions for assembly and operation must be readily available at all times and must be handed over to the responsible engineer when working on the device for his attention.

# Description

## Declaration of conformity

CE

This device corresponds to the requirements of the relevant guidelines and standards, if the corresponding regulations and the manufacturer's instructions are complied with.

## Function

The device contains a number of functions and must be set in accordance with use. The following functions are mapped in the System Manager:

- Cascade modulating boiler
- Cascade modulating boiler
- Control of 2 HS or 2-stage HS via relay
- Pellet function (leading HS swtich-off)
- Service water heating system, 2 mixed heating circuits, and 2 extra functions (use as fixed value pump heating circuit possible)
- Heating operation via buffer storage possible
- Solar functions
- Cooling operation
- Demand-related circulation pump control
- Automatic toggle between summer and winter time
- Activation of a timer for the entire heating system possible

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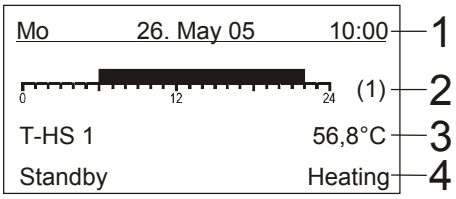
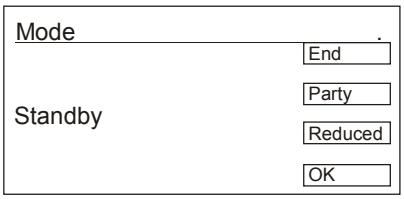
# Part 1: Operation

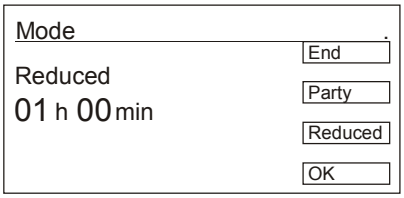
## *Normal Mode*

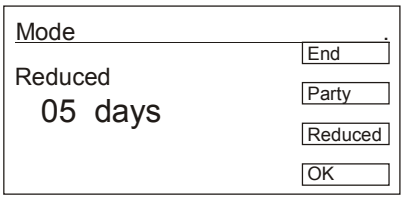



***!*** Due to the tolerances of sensors, deviations of +/- 2K (2°C) are normal between various temperature displays. Temperatures which change rapidly can have higher deviations for short periods due to the different time-related behaviour of various sensors.

***!*** The indicator of the current heating programs of all internal heating circuits of the controller is firmly anchored in the favorite level line [2]. The associated heating circuit is displayed in brackets. You can program all other favorites yourself. The rotary knob is used to change the display.




## For initial start-up or the "level Installation," please read the installation section.

### Control elements in normal mode

**Rotary knob**: Use the rotary knob to select a value from the favourite level for display in line 2

***Home* button**: Switch between operation of the controller and normal mode (standard display)

**F keys** => See line functions

### Display / line functions in normal mode

**Line 1**: Displays Day, Date and Time
F button: Adjust Date, Time and Holiday

**Line 2**: Displays Favorites (the selection of the currently displayed favourites takes place with the rotary knob)
F button: Adjust Favorites or additional displays

**Line 3**: Display the temperature of the heat generator 1 or the collector for cascades
F button: Display of the set temperature for the HS

**Line 4**: Left => Display of the central operating mode
Right => Display of the current situation of the first heating circuit – provided it is not remote controlled (Heating, Reducing, Party or Holiday)
F button: Adjust or activate the mode, the Party, Reducing or the Holiday function (valid for all internal heating circuits)

***!*** In order to adjust the values from the standard display, press the associated F button and adjust using the rotary knob or, if there are several values, first select the desired value with the F button. Save the value using the F button [OK].

### Setting the mode as well as the Party, Reducing and the "Direct Holiday Function"

In normal mode (standard display), press the F button [4].

The rotary knob can now be used to change the operating mode (see next page for the operating mode).
Save with "OK" => F button [4]
End without save with "End" => F button [1]

For the activation of the party or the reducing function, press the corresponding F button [2 or 3].
The rotary knob can now be used to set the heating time increase (Party) or the heating time interruption (Reducing).

If the heating or reducing needs to take place for the rest of the day, then you can turn the rotary knob to the left to heat or interrupt the heating for entire days. In this manner, a direct starting holiday program can be set very quickly (e.g. Reduced 5 Days)

## Selecting an operating mode

The selected operating mode is shown in the display. It takes effect when the setting is not changed for 5 s.

The following operating modes are available for selection:

**Cooling operation**
- Heating operation disabled (hot water preparation only)
- Start of the refrigerating machines if required by the heating circuit or the temperature Installation/T-Return Cooling is exceeded
- Heating circuits controlled to the temperature Heating circuitx/T-Flow Cooling

When MF function "cooling switch-over valve" is active => Hydraulic separation of the cooling circuit
- Actuation of the switch-over valve cooling

**Standby / OFF**
(Heating OFF and hot water preparation OFF, only frost protection mode)

**Automatic mode 1**
(Heating according to timer program 1; HW according to HW program)

**Automatic mode 2**
(Heating according to timer program 2; HW according to HW program)

**Summer mode**
(Heating OFF, HW according to HW program)

**Day mode**
(24 h heating with comfort temperature 1; HW according to HW program)

**Night mode**
(24 h heating with reduced temperature; HW according to HW program)

**Service** (automatic reset after 15 min)
The heat generator regulates to the maximum heat generator temperature. When the heat generator temperature has reached 65°C, the consumers are regulated to their maximum flow temperature to dissipate heat (emergency cooling).

***!*** The emergency cooling function must be explicitly enabled in the consumer circuits by means of a set value (B-Heat sink set value).

## Effect of the operating mode

The operating mode set here affects the boiler regulation and the integrated heating circuits of the controller.

Each heating circuit can be assigned a separate operating mode from the one set by means of the "operating mode" parameter in the user level of the corresponding heating circuit.

When the "⏻ = Standby/OFF", and "🛏 = Summer mode" operating modes are set, they have a reducing effect on all the heating circuits of consumer circuits in the entire system.

## *Operating mode*

### Control elements in operating mode

○ ***Home* button**: Switch between operation of the controller and normal mode (standard display)

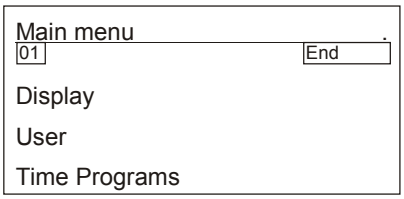
**Rotary knob**: Search for a level, or search for a set value/parameter, or adjust the selected value

Press **F buttons**:
- Select the adjacent level
- Select the adjacent value
- Select the adjacent function [text]

To change or query set values, an F button must first be pressed in normal mode:
=> Change/display the selected value

or the Home button must be pressed:
=> Controller switches to Operation mode

### Display in operating mode




### General operating procedure

- Home button => operating mode
- Use the rotary knob to find the area [type of values]
- Use the F button to select the area
- Use the rotary knob to search for the level [generator/consumer]
- Use the F button to select the level
- Use the rotary knob to search for the set/display value
- Use the F button to select the set/display value
- Use the rotary knob to change set value
- Use the F button to select the function/confirm the change.

### Selectable functions with the F buttons

[End] Cancels the current function without saving

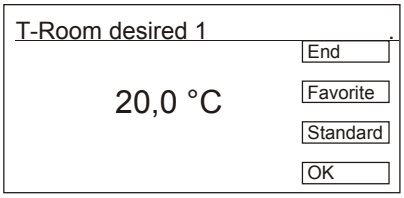
[Favorite] Transfers the set value to the favourite level

[Standard] Changes the set value to the factory setting

[OK] Cancels and saves the current function

[==>] Next set value (e.g. time: hour->minute)

[<==] Previous set value (e.g. date: month<-year)




**When the Home button is first activated after voltage is applied, the level installation is displayed once only. Once the values grouped here have been set the controller is operable.**
**When the level appears later on, e.g. after a power outage, the function can just be ended.**

### Areas [Type of set values]

**Display**

System value display (e.g. sensor values and setpoints). No adjustments can be made. Operating errors are therefore excluded in this area.

**User**

Summary of settings that can be made by the operator.

**Time program**

Summary of time programs for heating circuits, the hot water circuit and extra functions where applicable

**Time-Date**

Time, date, holiday program and data for the summer/winter changeover

**Service**

Summary of the values for the service technician

**Expert**

Summary of values for which expert knowledge is required to make settings (installation technician).

⚠ Values in the expert level are protected by a code no. (damage/malfunction possible).

**Expert HS (only for HS via BUS)**

Summary/display of the values sent to the BUS by the HS.

### Levels [Assignment of the set values]

The settings in the different areas are sorted into operating levels

**Installation**

All display values and settings that relate to the heat generator or the entire system and cannot be assigned to a consumer circuit.

**Hot-Water**

All display values and settings that affect central hot water preparation and circulation.

**Heatcircuit 1 / 2**

All indicator and set values that relate to the corresponding consumer circuit (also, for example, as decentral hot-water circuit).

**Solar/MF**

All indicator and set values that relate to solar energy recovery and settings for the multifunction relay.

***!*** An overview of all settings can be found on the following pages.

# Part 2: Overview of display values / settings

## *Display Range*

**!** Display only => no adjustment possible.

**!** Display only appears if the sensor is connected and the value is present in the system, otherwise "----" or no display.

**!** Exit the level with "End"

| **Installation** | |
|---|---|
| (HG => heat generator) use ⟳ to select parameters | |
| T-Outside | Outside temperature |
| Ext setpoint | External set value specification (0-10V) |
| T-Header | Collector temperature and set value (with F button) (only for cascades) |
| T-HS | Temperature boiler 1 (through 8) |
| HS State | Status (On/Off) boiler 1 through 8 |
| T-Solid Fuel | At boiler 2 = Boiler for solid fuel (A7) |
| T-Return 1 | Return flow temperature of HS 1 |
| T-Return 2 | Return flow temperature of HS 2 |
| T-Return total | Installation return flow temperature |
| T-Buffer T | Buffer storage tank temperature removal |
| T-Buffer M | Buffer storage tank temperature charging zone HS |
| T-Buffer B | Buffer storage tank solar zone |
| T-Storage 3 | Temperature of storage tank 3 (e.g. solar pool-heating) |
| Mod depth | Modulation degree of HS |
| Burner 1 | Status burner relay 1 (On/Off) |
| Burner 2 | Status burner relay 2 (On/Off) |
| Error | Error number; 00 = error-free |

| **Hot-Water** | |
|---|---|
| T-DHW | Current hot water temperature and current warm water set temperature as per heating program and operating mode |
| T-DHW B | Temperature of HW tank in the lower section (infeed/solar) |
| DHW require | Status heating requirement warm water (On/Off) |
| DHW pump | Status warm water loading pump (On/Off) |
| DHW release | Release hot water preparation (On/Off) |
| T-Circulation | Return flow temperature of the circulation |
| Circulation pump | Status circulation pump (On/Off) |

**Installation**

**T-Outside [F9]**

The measured outside temperature is smoothed for control purposes. The smoothed value is displayed here.

**Ext setpoint [F15]**

The 0-10V input can be used to preset an accumulative set value for the control system (see V-CURVE p. 26).

**T-Header (only for Cascades) [F8]**

The set value appears after the F button is pressed. The set value corresponds to the maximum required temperature of the consumer circuits from the heating system (incl. hot water preparation). The mixer circuits request the temperature + heating curve distance (expert value).

**T-HS [F8/F13 or BUS]**

Current measured temperature of all connected heat generators (only if sensors are present)

**HS State**

Additionally it is indicated whether the heat generator is switched on; in the case of two-stage heat generators, the status of the second stage is also displayed.

**T-Return total [F17]**

Return flow temperature for start of the refrigeration machines (see [T-Return cooling]).

**T-Buffer T/M/B [F3/F2/F1]**

(only if buffer storage is installed)
Buffer storage tank temperatures in the discharge area, the charging area and the infeed of alternative energy.

**Mod depth**

Display the required degree of modulation calculated and the current modulation levels for all active heaters. The ad is only when the corresponding figures are available (configuration, BUS, etc.).

**Hot-Water**

**T-DHW Rated (hot water set temperature)**

Display of the currently valid value for control.

**T-DHW (hot water temperature) [F6]**

Display of measured upper storage tank temperature.

**DHW-T B (storage tank bottom temp.) [F12]**

For example for solar or solid fuel infeed or for active charge-through function (CHARGE-THROUGH = 01). Display hot-water tank temperature in infeed area.

**T-Circulation (return flow temperature of circulation)**

Only if temperature control of the circulation function is activated.

| Heatcircuit 1 / 2 | |
|---|---|
| T-Room | Current room temperature and current room set temperature as per heating program and operating mode |
| Humidity | Display of room humidity (if value is available) |
| T-Pool | Current pool temperature and pool set temperature |
| T-DHW | Current warm water temperature and warm water set temperature |
| T-Flow | Current flow temperature and current flow set temperature |
| Circuit release | Heating circuit in heating mode (On/Off) |
| CH Pump | Status of the heating circuit pump (On/Off) |
| Need-Opti-Time | Previous time required to heat up with heat-up optimisation activated |

| Solar/MF | |
|---|---|
| T-MF1 | Temperature MF sensor 1 (=F11) |
| MF1 | Status of relay MF1 (On/Off) |
| T-MF2 | Temperature MF sensor 2 (=F12) |
| MF2 | Status of relay MF2 (On/Off) |
| T-MF3 | Temperature MF sensor 3 (=F13) |
| MF3 | Status of relay MF3 (On/Off) |
| T-MF4 | Temperature MF sensor 4 (=F14) |
| MF4 | Status of relay MF4 (On/Off) |
| T-Solar 1 | Temperature, collector 1 |
| T-Solar 2 | Temperature collector 2 |
| T-DHW | Current hot water temperature and current warm water set temperature as per heating program and operating mode |
| T-DHW B | Temperature of HW tank in the lower section (infeed/solar) |
| T-Buffer T | Buffer storage tank temperature removal |
| T-Buffer M | Buffer storage tank temperature charging zone HS |
| T-Buffer B | Buffer storage tank solar zone |
| T-Storage 3 | Storage 3 charging zone (F15) |
| Sol pump 1 | Status of collector pump 1 |
| Sol pump 2 | Status of collector pump 2 |
| Sol pump 3 | Status of the collector pump 3 |
| Charge ST HW | Status storage charging pump 1 |
| Charge ST BU | Status storage charging pump 2 / or the switch-over valve on Sp2 |
| Charge ST 3 | Status of storage charging pump 3 / or the switch-over valve on Sp3 |
| Charge DHW2 | Status transfer pump on 2nd DHW storage tank [F15] (cascade) |
| Charge BU2 | Status transfer pump on the 2nd buffer storage tank [F15] (cascade) |

## Heatcircuit 1 / 2

**T-Room (room temperature) [F2/F15]**

Only if a sensor or a FBR is connected.

**T-Pool (pool temperature) [F2/F15]**

Only if the heating circuit is configured as pool controller.

**T-DHW (hot water temperature) [F11/F5]**

Only if the heating circuit is configured as hot-water circuit.

**T-Flow (Flow temperature) [F11/F5]**

Display of the measured flow temperature of the heating circuit (only for mixed circuits) and display of the current flow set temperature for the control.

**Need-Opti-Time (last required heating-up time)**

Display of the time last required for heating-up.

## Solar/MF (Solar + Multifunction)

See the description for multifunction 1-4 under Expert.

***!*** This page only displays those parameters where the corresponding functions have been implemented and activated.

**T-MF(1-4) [F11-F14]**

A sensor is assigned to the four available multifunction relays respectively. If the sensor is not used by another standard function, a function that requires the sensor may be selected for the relay. In this case the measured value is displayed here.

In some special cases, e.g. when selecting the functions "return flow temperature increase" or "collector pump" the measured value is additionally displayed as T-Return under installation or as T-Solar under Solar/MF

**T-Solar (1,2) (collector temperature)**

Display of the collector pump temperature/s if solar installation configured via MF relay.

**Sol pump (1,2,3) (collector pump status)**

**Charge ST (DHW,BU,3)**
**(status of storage charging pump)**

Status indication of the configured solar pumps.
If only one storage tank is charged by the solar system, the associated MF relay must be configured as a storage charging pump (DHW, BU, 3).
A collector pump is only configured if either two collectors (East-West alignment) charge one/more than one storage tank or if multiple storage tanks are charged by the solar system (switch-over of charging via switch-over valves).

**Charge (DHW2,BU2) (status of transfer pump)**

Status indication of the transfer pump for cascade storage.

## *User Area*

All the settings that can be made by the operator of the system.

| Installation | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV*)** |
| Language | Acc. to version | English | |
| LCD Contrast | (-20) – (20) | 04 | |
| LCD Brightness | 00-30 | 30 | |
| °C / °F | Celsius, Fahrenheit | Celsius | |

***) IV = Internal Values:**
Space for entering the parameters stored in the system!

**Installation**

**English => Language**

Select controller language

**LCD Contrast**

Adjust intensity of display

**LCD Brightness**

Adjust the brightness of the display illumination.

**°C / °F**

Changeover between display of values in Celsius or Fahrenheit.

| Hot-Water | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| 1x hot water | Off/On | Off | |
| T-DHW 1 des | 10°C - 70°C | 60°C | |
| T-DHW 2 des | 10°C - 70°C | 60°C | |
| T-DHW 3 des | 10°C - 70°C | 60°C | |
| BoB-Value | 0K – 70K | 0 K | |
| Circl-Pump DHW | OFF/ON | OFF | |
| Antilegion | OFF/ON | OFF | |

**Hot-Water**

**1x hot water (1x hot water)**

On => The storage tank is enabled for charging (e.g. for showering outside hot water times). Charging starts when the temperature falls below "T-DHW 1 des" by the switching hysteresis.

**T-DHW des 1-3 (Hot water temperature setting)**

Required hot water temperature setting
T-DHW 1 des => used in first enable time,
T-DHW 2 des => used in second enable time,
T-DHW 3 des => used in third enable time of hot water program.

**BoB-Value (Operation Without Burner)**

Energy saving function for solar or solid fuel integration
For settings **> "0"** the burner is not activated for hot water preparation until the hot water temperature has dropped below the temperature setting by the set value + the switching hysteresis.

**Circ Pump HW (Circulation with hot water)**

On => The circulation pump runs when the hot water is enabled, but the circulation program is disabled.

**Antilegion (Hot water short time heating function)**

On => Activation of hot water short time heating function

Every 20th time that heating takes place or once per week on Saturday at 01:00 hrs the storage tank is heated up to 65°C.

It is possible to set up your own hot water short time heating function using the third hot water enable facility.

| Heatcircuit 1/2 | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| Operation | ----, Standby, Automatic 1 / 2, Summer, Heating, Reducing | ---- | |
| T-Room des 1 ***)** | 5°C - 40°C | 20°C | |
| T-Room des 2 *) | 5°C - 40°C | 20°C | |
| T-Room des 3 *) | 5°C - 40°C | 20°C | |
| T-Reduced***)** | 5°C - 40°C | 10°C | |
| T-Absence | 5°C - 40°C | 15°C | |
| T-Room cooling | ----, 20° - 40°C | 25°C | |
| Min TO cooling | ----, 0°C – 40°C | 27°C | |
| T-Limit Day | ----, (-5)°C–40°C | 19°C | |
| T-Limit Night | ----, (-5)°C–40°C | 10°C | |
| Heat-Slope | 0.00 - 3.00 | 1.20 | |
| Adaption | OFF/ON | OFF | |
| Room Influence | 00 - 20 | 10 | |
| T-Room adj | (-5.0)K – (5.0)K | 0.0 K | |
| Heat up opti | Off, T-Outside, T-Room | Off | |
| Max Opt-Time | 0:00 – 3:00 [h] | 2:00 [h] | |
| Opt reduced | 0:00 – 3:00 [h] | 0:00 [h] | |
| PC enable | 0000 - 9999 | 0000 | |

***)** or, depending on the function selected for the heating circuit, also
T-Pool, T-DHW, T-Flow Day or T-Flow Night
(see page 29)

### Operation

(also see page 7)
- - - - => The controller programming switch applies in this case.
When setting an alternative operating mode this only applies to the assigned heating circuit.

When the "Standby" and "Summer" operating mode of the controller programming switch are set, this has a reducing effect on all heating circuits and consumer circuits in the entire system.

### T-Room des 1-3

Required room temperature setting
T-Room des 1 => used in first enable time,
T-Room des 2 => used in second enable time,
T-Room des 3 => used in third enable time of active heating program for this heating circuit.

### T-Reduced

Required room temperature setting during night reduction

### T-Absence

Required room temperature setting during holidays

### T-Room cooling (only in cooling mode)

Starting condition for cooling function to room temperature
"----" = Without effect => Cooling operation enabled ****)**
If the operating mode Cooling is activated at the central control, this temperature is used as the set room temperature for this heating circuit. Cooling operation is activated when the temperature is exceeded. Cooling mode ends when the temperature drops 2K below.

### Min TO cooling (only in cooling mode)

Starting condition for cooling function to outside temperature
"----" = Without effect => Cooling operation enabled ****)**
If the operating mode Cooling is activated at the central control, cooling operation is activated for this heating circuit when the outside temperature exceeds the temperature set here. Cooling mode ends when the temperature drops 1K below.

****)** If starting conditions are set for room as well as outside temperature, both conditions must be met before cooling operation starts.

### T-Limit Day / T-Limit Night

Only valid if the function is activated => Set value "Expert/Heating circuit/Pump function = heating limits => Pump switching according to heating limit"

If the outside temperature that is measured and calculated by the controller exceeds the heating limit specified here, heating is disabled, the pumps switch off and the mixers are closed. The heating is enabled again when the outside temperature drops below the set heating limit by 1K (= 1°C).

T-Limit Day => applies during heating times
T-Limit Night => applies during reduction times

"----" => The heating limit is deactivated. The circulation pump is switched in accordance with the standard function (see chapter entitled "Circulation pump control")

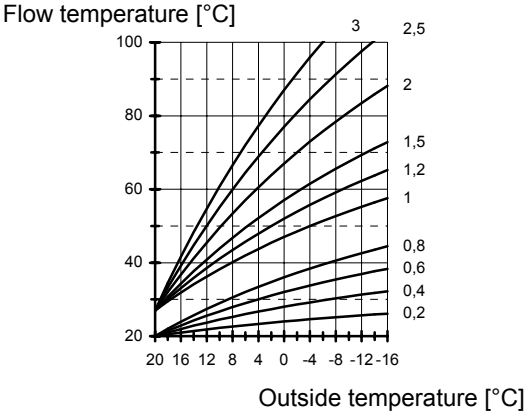
### Heat-Slope

The gradient of the heat slope indicates by how many degrees the flow temperature changes if the outside temperature rises or drops by 1 K.

Setting tip:

At cold outside temperatures, room temperature too low => Increase heat slope (and vice-versa)

At high outside temperature (e.g. 16°C) room temperature too low => correction via set room temperature




Heat slope diagram (setting aid)

**Setting 0 => Room control only**

***!*** The heat slope can best be set at outside temperatures below 5°C. The change in heat slope setting must be made in small steps and at long intervals (min. 5 to 6 hours) because the system must first adjust to the new values each time the heat slope is changed.

Guideline values

- Underfloor heating S = 0.4 to 0.6
- Radiator heating S = 1.0 to 1.5

**Adaption (Heating curve adaption)**

Only active if an FBR analogue room device is connected (room sensor + operating mode selection) and an outdoor sensor.

Function for automatic heal slope setting

Starting Conditions:

- External temperature < 8°C
- Operating mode is automatic (I or II)
- Duration of lowering phase at least 6 hours

At the beginning of the lowering period, the current room temperature is measured. During the next four hours, this temperature is used as the set point for the room regulator. The heating curve is calculated from the values determined during this time by the regulator for the flow pipe nominal temperature and the external temperature.

***!*** The parameter remains activated until the adjustment has been completed successfully without an interruption due, for example, to a Warm Up Temp or the hot water requirement of an external circuit.

***!*** During the adaptation, the water heating and the heating optimisation of the regulator are blocked.

**Room Influence (Room sensor influence)**

Only active if an FBR analogue room device is connected (room sensor + operating mode selection).

The HS temperature is increased by the set value when the temperature drops below the required room temperature by 1K.
=> High values lead to fast control and large HS temperature fluctuations.

- - - - => pure weather-dependent control
0 => pure weather-dependent control **)
20 => pure room temperature control

**) Special function with room influence = 0

For one-off heating requirements during the night reduction the heating pump continues to run until the next heating period is reached (see chapter entitled "Circulation pump control").

**T-Room adj (Room sensor adaptation)**

In the case of room control (e.g. with FBR) the measurement can be corrected using this setting if the room sensor is not measuring correctly.

**Heat up opti (heatup optimisation)**

Activation of function for automatically bringing forward the start of heating.

Example: Heating program 6.00 hrs – 22.30 hrs

**OFF:** Building starts to be heated at 6.00 hrs.

**ON:** Depending on weather and room temperature, heating starts soon enough so that building just reaches the set room temperature at 6.00 hrs.

00 => start of heating not brought forward
01 => brought forward depending on weather
02 => brought forward depending on room temperature *)

*) Only active if an FBR analogue room device is connected (room sensor + operating mode selection).

***!*** Heatup optimisation occurs only if the reduced time of the heating circuit is at least 6 hours.

**Max Opt-Time (Maximum bring-forward)**

Only active with "Optim Heat = T-Outside or T-Room"
The start of heating is brought forward by no more than this time.

**Opt reduced (Reduction optimisation)**

Automatic reduction of burner disabling to end of set heating time.

The burner is not restarted before the end of the heating period during the set time period (last heating time only) if it not already in operation.

This function prevents short-term heating of the heat generator to the end of the heating period.

**PC enable**

Code number for enabling access to heating circuit data from a PC
"0000" => access PC and terminal is blocked.
"0001“ => access is free of Terminal / access PC is blocked.

## *Timer Program Area*

All the time programs can be set in this area.

| **Adjusting a time program** | |
|---|---|
| Programs with maximum controller configuration | |
| Heatcircuit 1 Prg1 | 1. Heating program for Heatcircuit 1 |
| Heatcircuit 1 Prg2 | 2. Heating program for Heatcircuit 1 |
| ---- | ---- |
| Heatcircuit 2 Prg1 | 1. Heating program for Heatcircuit 2 |
| Heatcircuit 2 Prg2 | 2. Heating program for Heatcircuit 2 |
| ---- | ---- |
| Hot-Water | Program for hot water loading |
| Circulation | Program for hot water circulation |

Press the F button "Time Program"
Use ◌ to search for the desired time program
=> e.g. "Heatcircuit 2 Prog2"
Use the F button [here button 3] to select time program
=> "Heatcircuit 2 Prog2" "Monday"
Use ◌ to search for weekday/block
=> e.g. "Mo - Fr" (Monday – Friday)
Use the F button [OK] to select a block
=> "06:00 -- 08:00", "16:00 -- 22:00", --:-- -- --:--"
Use the F button [OK] to select a time
=> "06:00 -- 08:00", "16:00 -- 22:00", --:-- -- --:--"
Use the rotary knob to adjust the time
=> "06:00 -- 08:00", "17:00 -- 22:00", --:-- -- --:--"
Use the F button [OK] to save a new program
Use the F button [End] to exit a block

When connecting a digital room controller with heating program input, the corresponding heating program in this controller is automatically superseded.

### Heating circuits and hot water

### Heatcircuit 1

Heating program 1 => factory setting:

Mo. to Fr.: 06:00 to 22.00
Sa. and Su.: 07:00 to 23:00

| ✎ | Heating time 1 | | Heating time 2 | | Heating time 3 | |
|---|---|---|---|---|---|---|
| Mo. | | | | | | |
| Tu. | | | | | | |
| We. | | | | | | |
| Th. | | | | | | |
| Fr. | | | | | | |
| Sa. | | | | | | |
| Su. | | | | | | |

Heating program 2 => factory setting:

Mo. to Fr.: 06:00 to 08.00, 16:00 to 22:00
Sa. and Su.: 07:00 to 23:00

| ✎ | Heating time 1 | | Heating time 2 | | Heating time 3 | |
|---|---|---|---|---|---|---|
| Mo. | | | | | | |
| Tu. | | | | | | |
| We. | | | | | | |
| Th. | | | | | | |
| Fr. | | | | | | |
| Sa. | | | | | | |
| Su. | | | | | | |

### Hot-Water

Factory setting:
Mo. to Fr.: 05:00 to 21.00
Sa. and Su.: 06:00 to 22:00

| ✎ | Heating time 1 | | Heating time 2 | | Heating time 3 | |
|---|---|---|---|---|---|---|
| Mo. | | | | | | |
| Tu. | | | | | | |
| We. | | | | | | |
| Th. | | | | | | |
| Fr. | | | | | | |
| Sa. | | | | | | |
| Su. | | | | | | |

### Heatcircuit 2

Heating program 1 => factory setting:

Mo. to Fr.: 06:00 to 22.00
Sa. and Su.: 07:00 to 23:00

| ✎ | Heating time 1 | | Heating time 2 | | Heating time 3 | |
|---|---|---|---|---|---|---|
| Mo. | | | | | | |
| Tu. | | | | | | |
| We. | | | | | | |
| Th. | | | | | | |
| Fr. | | | | | | |
| Sa. | | | | | | |
| Su. | | | | | | |

Heating program 2 => factory setting:

Mo. to Fr.: 06:00 to 08.00, 16:00 to 22:00
Sa. and Su.: 07:00 to 23:00

| ✎ | Heating time 1 | | Heating time 2 | | Heating time 3 | |
|---|---|---|---|---|---|---|
| Mo. | | | | | | |
| Tu. | | | | | | |
| We. | | | | | | |
| Th. | | | | | | |
| Fr. | | | | | | |
| Sa. | | | | | | |
| Su. | | | | | | |

### Circulation

Factory setting:
Mo. to Fr.: 05:00 to 21.00
Sa. and Su.: 06:00 to 22:00

| ✎ | Heating time 1 | | Heating time 2 | | Heating time 3 | |
|---|---|---|---|---|---|---|
| Mo. | | | | | | |
| Tu. | | | | | | |
| We. | | | | | | |
| Th. | | | | | | |
| Fr. | | | | | | |
| Sa. | | | | | | |
| Su. | | | | | | |

## *Time Program for Solar*

**Kick function enabling**

Factory setting:

Mo. to Su.: 00:00 to 24:00

| | Heating time 1 | |
|---|---|---|
| Mo.-Su. | | |

## *Area Time-Date*

This area contains different values for the user in order to provide rapid access.

| **Parameters on the Time-Date level** | |
|---|---|
| Time (hh:mm) | Set hour, F button [==>], hh:mm, set minutes |
| Date (dd. month yy) | Set year, F button [<==], set month, F button [<==], set day, |
| Holiday begin (dd. month yy) | Set date for begin of the holiday time |
| Holiday end (dd. month yy) | Set date for end of the holiday time |
| Start Summertime (dd. month) | Set date for begin of clock change |
| Stop Summertime (dd. month) | Set date for end of clock change |

**Parameters on the Time-Date level**

**Time**

(Not for Time Master or DCF in the system)

***!*** There may be a time difference of up to 2 minutes per month (correct time if necessary). If a DCF receiver is connected the correct time is always displayed.

**Time Master for all controllers**

***!*** If a heating system controller has been set to be the Time Master (time setting for all controllers, see Expert/Configuration) or a DCF (Radio time receiver) has been installed in the system, the time is blanked out on all the other controllers in the system.

***!*** A max. of one Time Master can be set on the BUS.

**Date**

Please first set the year and then the month. Then the number of days of the month are calculated during the setting.

**Holiday function**

***!*** Please do not enter the day of travel as the start date, but the first day of the holiday (no more heating from this day).

***!*** Please do not enter the day of travel as the end date, but the last day on which there is to be no heating. When you arrive home the house should be warm and there should be hot water.

***!*** Stop holiday function => e.g. for early return by pressing the program switch.

**Automatic summer/winter time changeover**

The current weekday is calculated automatically. It is shown the standard display.

It is possible to change from summer to winter time by entering the date.

***!*** The default setting is valid for Central European time zones. A modification is only required if the date for the time change is changed by political decree.

***!*** The earliest date on which the change will occur must be set. The controller performs the time change on the Sunday following this date at 2.00 am or 3.00 am.

***!*** If no time change is required, please set month stop to the same value as month start and day stop to the same value as day start.

## ***Service area***

This area contains values for the customer service engineers in order to provide rapid access.

Use the F button to select a level (e.g. Relay Test).

| **Relay Test** | |
|---|---|
| 00 | Normal mode => Relay after control |
| 01 | A1: Pump, Heatcircuit 1 |
| 02 | A2: Pump, Heatcircuit 2 |
| 03 | A3: Hot water charging pump |
| 04 | A4: Mixer Open, Heatcircuit 2 |
| 05 | A5: Mixer Close, Heatcircuit 2 |
| 06 | A6: HS 1 On |
| 07 | A7: HS 2 On [2-stage:HS 1+2 (after 10s) ON] |
| 08 | A8: Mixer Open Heatcircuit 1 / Multifunction 1 |
| 09 | A9: Mixer Close Heatcircuit 1 / Multifunction 2 |
| 10 | A10: Multifunction 3 |
| 11 | A12: Collector pump / Multifunction 4 |

| **Sensor Test** | |
|---|---|
| Sensor 01 | Buffer storage temperature Lower |
| Sensor 02 | Buffer storage temperature middle or room temperature heatcircuit 1 |
| Sensor 03 | Upper buffer storage temperature |
| Sensor 05 | Flow temperature, heatcircuit 2 |
| Sensor 06 | Upper hot water temperature |
| Sensor 08 | Heat generator / header temperature |
| Sensor 09 | Outside temperature |
| Sensor 11 | Flow temperature heatcircuit 1 temperature multifunction 1 |
| Sensor 12 | Hot water temperature lower or temperature multifunction 2 |
| Sensor 13 | Solid fuel HS temperature or collector 2 or temperature multifunction 3 |
| Sensor 14 | Collector 1 temperature or temperature 4 |
| Sensor 15 Light 0-10V | Room temperature heatcircuit 2 or measured value of the light sensor or voltage value 0-10V input |
| Sensor 17 | Return flow temperature of whole heating system for cooling operation |

### Relay status and test

#### Relay Test

Use the shaft encoder to select the relay (01-11)
=> The selected relay is switched on. All other relays are switched off.

Exception: Burner 2; the burner stage 1 remains switched on here, since otherwise the second burner stage cannot be activated

***!*** A code number must be entered for this function.

#### Code-No Entry

◌ 1.Set number
F button [==>] next number
◌ 2.Set number
F button [==>] next number
◌ 3.Set number
F button [==>] next number
◌ 4.Set number
Use the F button [OK] to activate the Code-No
=> "Relay Test"

⚠ The relay test is automatically cancelled after 5 minutes without an operation.

### Sensor Test

Use the F button to start the sensor test with, use ◌ to select the sensor =>
temperature is displayed; use the F button [End] to end the sensor test

| **Other entries** (Service area)<br>Use ◌ to select a value | |
|---|---|
| Software number<br>XXX.XX | Software number with index |
| Cascade manual operation<br>(1-8; only with code no.) | Starting different burner stages of the cascade |
| Burner time | Burner time for all stages |
| Burner starts | Burner starts for all stages |
| STL-Test | Safety temperature limiter test with heat generator temperature display =>Start with F button<br>(hold down)! |
| Service<br>(only with code no.) | Input of date or hours for service messages |
| Reset User | Load user parameter factory settings |
| Reset Expert<br>(only with code number) | Load expert parameter factory settings |
| Reset Time Prog | Load time program factory settings |
| Communic BM 1 | Remote control HC1 on BUS |
| Communic BM 2 | Remote control HC2 on BUS |
| Use the F button [End] to exit the level | |

### Software number XXX.XX

Display software number with index (please specify if you experience problems / have questions about the controller)

### Cascade manual operation (only with code number)

(only for cascades in "Service" operation mode)
Use F button to open level and search using.◌
After selecting the heat generator with the F button an output can be selected for this boiler.
With respect to multi-stage heat generators, the second stage can be activated by means of presetting an output value > 50%. After closing the service functions the entries are reset automatically.

### Burner time and Burner starts

For example, select "Burner time" (F button).

=> Shows the current values ( ◌ )

Reset display: Use the F button to select the boiler and the level. Use the F button to "Reset"

Use the F button [End]=> to exit the level

### STL-test

Start the STL-test (F button). Use ◌ to search for the boiler. Use the F button to select the boiler

=> Display heat generator temperature.

Press and hold the "Start" button until the STL is activated:
Burner I ON all pumps OFF and all mixers CLOSED

The temperature can be observed in the display.

### Service

#### By date

Activation by entering date for the yearly service message.
**Delete programmed annual message:**
Set the value date => year to "Off" (< 01) in the General/Service/Customer Service level.

#### After operating hours

Activation by entering operating hours of the installation after which a service message should be put out.
**Delete programmed message:**
Set the value Operating H to "Off" (< 50) in the General/Service/Customer Service level.

### Delete the displayed maintenance message

Press the F button, use ◌ to set the repeat value to "00", confirm with F button [OK].

### Reset …

The three value groups can be reset to the factory setting using the Reset function.
Use the F button to select the Reset function, use ◌ to set it to "On" and use the [OK] button to load the standard values. Use the F button [End] to exit the level (or Home button).

## *Expert area*

It is only possible to change the fitter set values after entering the code number.

⚠ If these values are set incorrectly, they may cause malfunctions or damage to the system.

### Code-No input

↻ 1.Set number
F button [==>] next number
↻ 2.Set number
F button [==>] next number
↻ 3.Set number
F button [==>] next number
↻ 4.Set number
Use the F button [OK] to save the code number

### System configuration

**Configuration**

| Designation | Value range | Standard | IV |
|---|---|---|---|
| Change code | 0000 - 9999 | 0000 | |
| BUS ID 1 | (00), 01-15 | 01 | |
| BUS ID 2 | (00), 01-15 | 02 | |
| BUS Termination | Off/On | On | |
| eBUS Supply | Off/On | On | |
| Time Master | Off/On | Off | |
| Plant select | ----, 01 - 10 | ---- | |
| HS1 Type | 00 – 06 | 03 | |
| HS1 BUS | 00 – 05 | 00 | |
| HS2 Type | 00 – 22 | 00 | |
| Storage HS2 | 00 – 03 | 00 | |
| Buffer | 00, 01, 02 | 00 | |
| Cool Operation | Off/On | Off | |
| F15 Function | 00 - 05 | 00 | |
| Sensors | 1k / 5k Sensors | 5k Sens. | |
| Use the F button [End] to exit the level | | | |

### Change code

Input of a new code number (It is essential to remember the new code number after adjustment).

### **BUS ID 1 / 2** (Heating circuit number)

The heating circuits are sequentially numbered starting with "01". heating circuit numbers must not be assigned twice. For replacement controllers however, please enter exactly the same heating circuit numbers as the replaced controller.

### **BUS Termination** (bus termination resistor)

The bus terminating resistor must be available once in the bus system (HG controller or cascade controller).
When installing with a CoCo, set 1 to "Off".
Off => The resistor is not set
On => The resistor is set

### **eBUS Supply** (supply for eBUS)

Switching the eBUS supply on / off in relation to connected devices (power supply balance).

### Time Master

(Only without or Time Master in system)

Off = no time master, each heating circuit has its own time
On = controller is time master, all controllers and remote controls take over the time settings of this controller.

***!*** No more than 1 Time Master is permitted in the system!

### Plant Select (selecting basic controller functions)

This set value can be used to preset the other values of the start-up level
(see also installation description on page 40).

When the installation set value is selected, this also displays "----" = no change to preset => values retain their previously defined status
(values on delivery: Merlin 0634 2-stage burner; hot water preparation two mixed heating circuits).

01 = [4034] => cascade controller for modulating boiler
02 = [4834] => cascade controller for switching boiler
03 = [3611] => 0-10V controller
04 = [0634] => Standard controller with 2-stage HS
05 = 2HS controller => 2 HS cascade switched via relay
06 = [6644] => buffer and pellet controller with solar function
07 = [1144] => Mixer valve extension
09 = [0321] => Cooling function in heating circuit return
10 = [0321] => Central cooling function and solar integration

### **HS1 Type** (first heat generator type)

00 = No heat generator (Mixer valve extension)
01 = Single stage HS switching
02 = Single stage modulating
03 = 2-stage HS switching (second stage via A7)
04 = Two individual HS switching (second HS via A7)
05 = Multistage switching (cascade via BUS)
06 = Multistage modulating (cascade via BUS)

**HS1 BUS** (connection for HS)

00 = Relay => Standard (switching HS)
01 = CAN-BUS => Standard (cascade switching)
02 = eBUS => HS without temperature controller
=> Preset modulation depth
=> Standard (cascade modulating)
03 = eBUS => HS with temperature controller
=> Preset desired temperature
[not suitable for cascade]
04 = 0-10V Presetting of the desired temperature [T-HS DES]
only for HS1 Type = 01, 02 or 03
Burner relays are controlled in parallel
Sensor KF [F8] must be connected
05 = 0-10V Preset modulation depth only for HS1 Type = 02

**HS2 Type** (second heat generator type => A7)

(For HS1 with 2-stage burner – not active)

00 = No secondary heat generator
01 = Single stage HS switching
08 = Cooling 1
20 = Solid fuel integration
(additional non-controllable HS)
for switching behaviour, see parameter HS2 storage
21 = Collector pump
22 = Pump for HS1
(e.g. additional HS for cascades)

**Storage HS2** (heat accumulator for HS2)

(Only where HS2 Type = Solid fuel)

Warm-up relief applies superordinated:
ON: T-HS2 > Min T-HS2
OFF: T-HS2 < [Min T-HS2 – 5K]
T-HS2 = Solid fuel burner temperature

00 = Heating vis-à-vis collector (no storage tank) => F8
ON: T-HS2 > [F8 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F8 + Hyst Burner 2]

01 = Heating vis-à-vis buffer storage tank => F1, F3
ON: T-HS2 > [F3 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F1 + Hyst Burner 2]

02 = Heating vis-à-vis HW tank => F6
ON: T-HS2 > [F6 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F6 + Hyst Burner 2]

03 = Heating vis-à-vis STORAGE III (Pool) => F15
ON: T-HS2 > [F15 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F15 + Hyst Burner 2]

Switching pattern

The pump is switched on if the temperature of the solid fuel boiler exceeds the temperature of the Reference sensor by the hysteresis (Hyst Burner 2 + 5K). Switching off occurs when the temperature drops 5K below the switch-on temperature.

Warm up Temp

Switching off occurs when the temperature of the solid fuel boiler drops below the set limit temperature (Min T-HS2) by 5K. The pump is enabled again when the temperature of the solid fuel boiler exceeds the set limit temperature (Min T-HS2).

**Buffer** (heater buffer storage type)

***!*** After activation (01 or 02) it is not possible to connect a FBR for heatcircuit 1.

00 = no buffer storage for heating operation

01 = Buffer storage for heating operation (F2, F3)
HS1 is activated with reference to sensor "buffer top" (F3)

DHW Relief operates on sensor "buffer top".

HW charge pump ON:
"Upper buffer" > HWactual + 5K Hysteresis
HW charge pump OFF:
"Upper buffer" < HWactual

02 = Combination storage tank for heating and HW operation
HS1 is activated with reference to sensor "buffer middle" (F2)

DHW Relief operates on boiler sensor BS.

HW charge pump ON:
BS > HWactual + 5K Hysteresis
HW charge pump OFF:
BS < HWactual

03 = passive buffer storage for heating operation (F1, F3)
The buffer will not load by the conventional Heat generator producers. The use occurs, e.g., through solar buffer loading [Buffer charging pump], [return flow temperature increase] or [transfer pump for buffer storage] (sensor usable).

In this attitude no change of the regulation of the heating takes place in relation to the without buffers

**Cool Operation (Space cooling via operating mode)**

The mode of operation cooling and the necessary settings are released. In the mode of operation cooling the heating circles can be used for the cooling of the room. For this function a refrigerating machine is necessary.

**F15 function (sensor function for F15)**

00 = Room sensor for heatcircuit 2. if a further sensor at the pulse input [IMP = F17] is detected at this position, an FBR is evaluated at F15 and F17. If F17 is used by a different function, an RFB is evaluated at F15.

01 = 0-10V input for presetting an external collector set temperature. On evaluation see Parameter [V-Curve] in the “Expert/0-10V I/O”-level.

02 = Light sensor => without function

03 = 0...10V input for presetting an external modulation depth. On evaluation see Parameter [V-Curve] in the “Expert/0-10V I/O”-level.

04 = secondary sensor for MF function

05 = storage tank 3 (e.g. pool)

**Set values for heat generators**

| Heat generator | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| Max T-HS1 | 30°C - 110°C | 85°C | |
| Min T-HS1 | 10°C - 80°C | 40°C | |
| Min T-HS2 | 10°C - 80°C | 40°C | |
| Max T-Header | 30°C - 110°C | 85°C | |
| Min T-Header | 10°C - 80°C | 40°C | |
| Warm Up Temp | 10°C - 85°C | 35°C | |
| Min Delimi | 00, 01, 02 | 00 | |
| Hysteresis (or Hyst HS) | 5K – 20K | 5 K | |
| Hysteresis time | 00 min – 30 min | 00 min | |
| Time Seq-Mod | 00 - 800 hours | 00 hours | |
| Block-Time | 00 min – 30min | 00 min | |
| Hyst Burner 2 | 2K – 20K | 2 K | |
| Gradient | On/Off | Off | |
| Max reduce | 1 - 20K | 10K | |
| Dyn cutoff | 0.5K/min - 10K/min | 2 - K/min | |
| HS Cool-fct | Off/On | Off | |
| T-HS Cool | 30°C - -120°C | 95°C | |
| Use the F button [End] to exit the level | | | |

**Max T-HS1** (Max. temperature Boiler)

- Protects the HS from overheating / prevents triggering the LIMITER.

***!*** Caution: Also works with hot water preparation.

**Min T-HS1/2** (min temperature Boiler)

Decreased condensation build-up in HS with low heat requirements. Switching the HS off is always done earlier when achieving the HS minimum temperature MIN T-HS1/2+ Hysteresis (standard 5 K) => see also Min Delimi

**Max/Min T-Header** (only for cascade)

See Max/Min T-HS 1/2..

## Protection from condensate

**Warm Up Temp**

(Not in cascade operation)
Reduces operation in condensation zone. The circulation pumps are switched off and the mixers are shut until the boiler has reached the start-up temperature.

**Min Delimi** (minimum delimiter HS)

(Not in cascade operation)
Decreased condensation build-up in HS with low heat requirements. Switching the HS off is always done earlier when achieving the HS minimum temperature Min T-HS1 + Hysteresis (5K)

00 = Minimum delimiter for heat curve
The HS switches on if the requested temperature has been exceeded by the using components.

01 = Minimum delimiter with heat requirement
The HS holds at least the set minimum temperature Min T-HS1 at heating requirements (pump release).

02 = Permanent minimum delimiter (24) The HS holds 24h at least the set minimum temperature Min T-HS1. at heating requirements (Pump release).

**Hysteresis with hysteresis time**

Function for optimising the boiler operation with differing heat-generator loads.

The effective switching hysteresis is reduced linearly after the burner is switched on from the set Hysteresis to the minimum hysteresis (=5K) during the hysteresis time.

**Low heat consumption**
In this case the higher Hysteresis setting takes effect. Short run-times and frequent burner operation are prevented.

**High heat consumption**
During longer periods of burner operation (high heating load) the hysteresis is automatically reduced to 5K. This prevents the heat generator from heating to unnecessarily high temperatures.

## Two-stage heat generators

(Only in the case of 2-stage or two heat generators via burner relays 1 and 2)

**Time Seq-Mod** (time to sequence change)

For operation with at least 2 heat generators there is the option to swap the boiler sequence after the operating hours specified here of the first heat generator of the active sequence.

00 = no HS Sequence

**Block-Time** (delay time for next stage)

Min. delay time after switching on or with switching HS, also when switching a layer off until switching the next layer on.

***!*** 00 = 10 sec; For correct settings, also ensure the internal Block-Time for the closed burner control.

**Hyst Burner 2** (for solid fuel / 2nd burner)

(only for 2-stage burners or solid fuel integration)

Solid fuel integration: Hysteresis for the charging pump

2. Burner 2 and burner stage 2: see next page => Switching pattern for 2-stage burners

## Gradient method

(only applies for HS 1)

This method permits early switch off of a heat generator when heat consumption is low.
Example: Pellet boiler => When heat consumption is low, a pellet boiler may possibly need to be switched off before the set temperature is reached (burnt out). The optimum switch off point is determined from the speed of the temperature increase of the pellet boiler ([K/min] = gradient).

**Gradient**

On = Switch off according to gradient method
Off = Switch off by set value + Hysteresis

**Max reduce**

The value set determines the earliest switch off point as a difference to the maximum temperature Max T-HS for heat generator HS1:
Min. switch off point = Max T-HS – Max reduce

**Dyn cutoff**

Load-sensitive, premature deactivation of the HS by the gradient of the temperature increase [K/min]. When the HS is operating without load, the gradient value is high. When the HS reaches or exceeds the gradient set here, the HS is switched off at the earliest dynamic switch off point (Max T-HS - Max reduce). If the temperature increase is less, the switch off point is increased linearly up to Max T-HS.

## HS emergency cooling

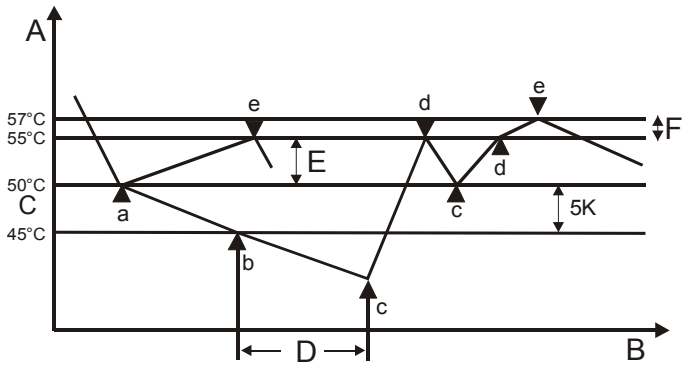
**HS Cool-fct** (activation of the emergency cooling function for HS)

**with T-HS Cool** (starting temperature for cooling)

***!*** Valid for the first boiler and the solid fuel boiler (multifunction relay or boiler 2)

If the emergency cooling function for the heat generators is activated (HS Cool-fct = On), then the heating circuits commence operation with Max T-Flow (provided emergency cooling is permitted in the heating circuit) as soon as the set temperature T-HS Cool is exceeded by one of the heat generators. The emergency cooling function terminates when the temperature drops below the starting temperature T-HS Cool by 5K.

## Switching pattern for 2-stage burners




A Boiler temperature
B Time
C Boiler temperature setting
D Block-Time (blocking time 2. burner stage)
E Hysteresis (dynamic switching hysteresis)
F Hyst Burner 2 (Hysteresis for shutdown)

a Module 1 on
b Start of blocking time 2. Burner stage
c Module 2 on (module 2 enable)
d Module 2 off
e Module 1 off (cancel module 2 enable)

***!*** This switching patterns is also effective for operating two switching heat generators via the burner relays A6 and A7.

Switch on the 1st Burner stage when temperature drops below set temperature of the heat generator.

Switch off the 1st Burner stage when the temperature setting is exceeded by the hysteresis.

Switch on the 2nd Burner stage
- after start of 1st Burner stage
- and temperature drops below set temperature by 5K (= Start of the Block-Time)
- and expiry of the Block-Time (= Release 2nd burner stage)

Switch off 2nd Burner stage when the temperature setting is exceeded by the hysteresis.

Switch 2nd Burner stage when temperature drops below set temperature of the heat generator.

Switch off the 1st Burner stage when 2nd stage enabled after temperature setting exceeded by the value [Hysteresis + Hyst Burner 2]

## Switching behaviour of the HS with gradient method

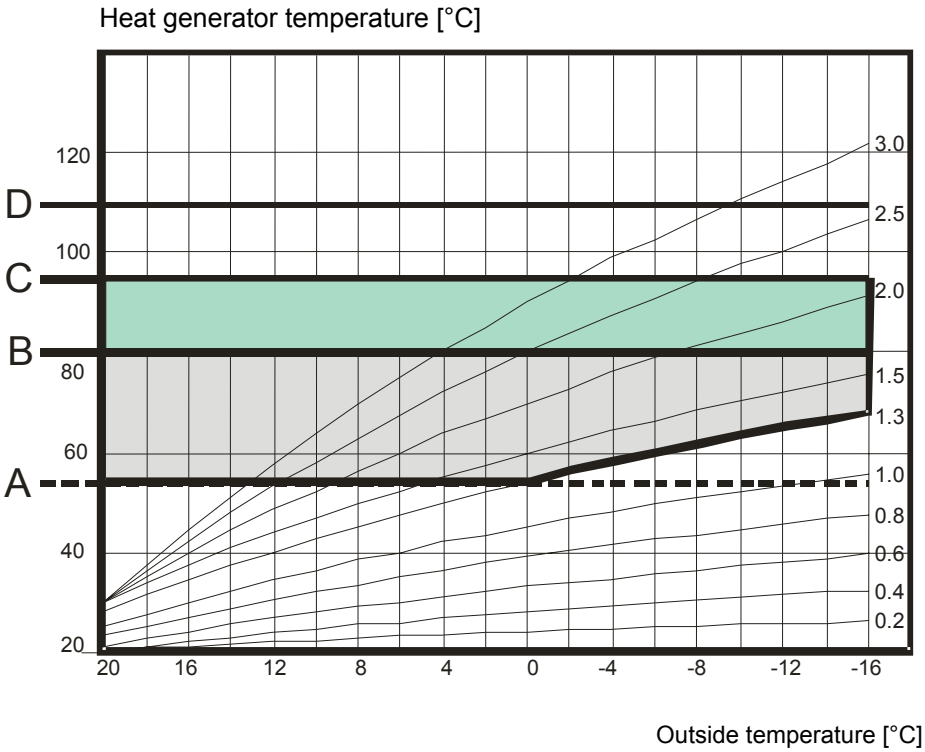
Parameter Gradient = On => Premature deactivation (or deactivation in due time) of a heat generator (burnt out in the case of pellet)

A Min T-HS = Minimum heat generator temperature => Switch off point to minimum temperature or calculated desired temperature (here according to heat slope 1,3)

B [(Max T-HS) – (Max reduce)] = Earliest switch off point using gradient procedure; takes effect when heat consumption is low (rapid heat generator temperature increase)

C Max T-HS = Latest switch off point using gradient procedure; takes effect when heat consumption is high (slow HS temperature increase)

D T-HS Cool = When the HS reaches this temperature, the emergency cooling function via the consumer circuits is activated.




Heat slope diagram (setting aid)

## Set values for cascade control

(only for cascades)

| Cascade | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| Detected HSS | Display only | | |
| Capacity / Stage | 00 – 9950 kW | 00 kW | |
| BUS Scan | On/Off | Off | |
| Min Mod Cascade | 00 – 100 % | 00 | |
| DHW HS | 01 - 08 | 00 | |
| Control Deviation | [K] | Display | |
| Desired Output | 0-100 [%] | Display | |
| Switch Value | (-99) - 0 – (99) | Display | |
| Block Time | Remaining [min] | Display | |
| Max T-Module | 50°C – 110°C | 90°C | |
| Dyn Upward | 20 - 500 K | 100 K | |
| Dyn Downward | 20 - 500 K | 100 K | |
| Reset Time | 5 - 500 | 50 | |
| Modulation Max | 50% - 100% | 80 % | |
| Modulation Min | 10% - 60% | 30 % | |
| Min Mod HS | 0% - 60% | 30 % | |
| Modulat DHW | 40% - 100% | 80 % | |
| Sequence 1 | - | 1 2 3 4 5 6 7 8 | |
| Sequence 2 | - | 8 7 6 5 4 3 2 1 | |
| Sequ Change | Sequence 1, Sequence 2, Timed, 1/2 switch, Rotating, Sorting | 01 | |
| Time Seq-Mod | 0 - 800 hours | 0 hours | |
| Block-Time | 00 min – 30 min | 00 min | |
| Use the F button [End] to exit the level | | | |

**Detected HSS** (number of heat generators)

Display of heat generators automatically reported via BUS with bus ID (boiler no.). An "X" on the display indicates that a heat generator has responded on the BUS.

**Capacity / Stage** (heat generator output for each stage)

Display of the HS number and the stage => Selection with Prog button => Input/Adjustment of HS output

- - - - = Stage / HS not available

0 = Stage available and deactivated

In the case of heat generators with the same output, a boiler release is sufficient; e.g.:

HG 1 01 => 01
HG 1 02 => 01
HG 2 01 => 01 etc.
(depending on the number of boilers)

Automatic assignment:

After restarting or after a new configuration, the controller searches the bus systems for a heat generator. Within this time period (approx. 1 min) no manual output entries are allowed [Display "SCAN"]. In the case that a heat generator answers with output information, this output is automatically entered into the list. In the case that a heat generator answers without output information, 15kW is entered into the list. This value can then be adjusted manually.

**BUS Scan**

This function searches for heat generators on the BUS. If the displayed configuration is correct, it can be saved using the "Config OK" button. This procedure will overwrite all the current values.

**min Mod Cascade (min. modulation cascade)**

If the cascade controller calculates an overall modulation rate greater than zero and less than "min Mod Cascade," the overall modulation rate is set to the value "min Mod Cascade." The Lock Time is simultaneously set to 10s.

**DHW HS** (number of stages for HW operation)

00 = HW preparation via header

01 - 08 = Number of heat generators in the cascade which are coupled out of the cascade hydraulically for hot water preparation.

***!*** It is essential that the HW Modules are at the beginning of the BUS ID sequence => 01 - xx.

**Control Deviation** (collector control deviation)

Display of the header control variance
(set temperature – actual temperature).

**Desired Output** (required system output [in %])

Display of currently required total output % (0-100)

=> Calculated set value from control system = System load in per cent. The value is calculated, floating, and does not take any skips caused by the switching operation into account.

**Switch Value** (-99 – +99)

Internal control value => only for switching cascade!

If this value reaches "0", the next heat generator is also connected (only after the delay time has elapsed). If the switching value reaches "-0", the last heat generator is switched off.
If the desired temperature is exceeded by 1K, the last heat generator is also switched off.

**Block Time** (currently remaining value)

Display of current delay time. Only if "delay = 0" is it possible to operate the next heat generator.

**Max T-Module** (maximum temperature of the boiler)

Protects individual heat generators in the cascade from overheating / prevents triggering LIMITER (limiter value).

This parameter is used to set a temperature at which the different heat generators switch themselves off, or - in the case of modulating heat generators - modulate themselves down. The heat generators are switched on again if they drop below this temperature by 5K

***!*** The Max T-HS temperature must be higher than the maximum collector temperature.

**Dyn Upward** (dyn. heat generator connection [K])

Small value = fast connection
Large value = slow connection

⚠ Values set too low can lead to overheating or short-term connection of a heat generator.

Calculation: If the cumulative system deviation in Kelvin reaches the set value A, this results in connection of all heat generator stages.

**Dyn Downward**
**(dynamic heat generator deactivation [K])**

Small value = fast deactivation
Large value = slow deactivation

⚠ Values set to high can lead to overheating and triggering the STB

Calculation: If the cumulative system deviation in Kelvin reaches the set value A, this results in deactivation of all heat generators.

**Reset Time** (reset time for I-Control)

⚠ Control value: Changing this value can cause the control system to overshoot. The recommended default settings should be retained.

***!*** Small values cause the mixer to adjust quickly and can lead to oscillation.

**Modulation Max**

If this modulation degree is exceeded the next heat generator in sequence is connected after the delay time elapses.

**Modulation Min**

If values drop below this modulation degree the last heat generator of the current sequence is switched off.

**Min Mod HS**

Connection of the next heat generator will only occur, if the resulting modulation degree for the different heat generators then exceeds the value set here.
=> For optimum operation with maximum number of burners: Set “Modulation Max” = 0 and “Modulation Min” to the minimum modulation degree for heat generator stages.

**Modulat DHW** (only for HW modules)

Entry of the set modulation degree for the heat generators in hot water operation (see DHW HS).

**Sequence 1** (Sequence 1)

Entry of the sequence in which the heat generators are set into operation in sequence 1.
F button [==>] Boiler number selection
◌ Input of the boiler number

**Sequence 2** (Sequence 2)

Entry of the sequence in which the heat generators are set into operation in sequence 2.
F button [==>] Boiler number selection
◌ Input of the boiler number

***!*** With respect to two-stage heat generators, the second stage is always switched after the first stage.

**Sequ Change** (type of sequence change)

- Sequence 1 only
- Sequence 2 only
- Timed: Change between sequence 1 and 2 according to operating hours of the first heat generator of the active sequence.
- 1/2 switch: Conversion for heat generator with a different nominal output: When the second boiler is switched on, the first boiler will be put out of operation until activated again.
- Rotating: The first boiler of the sequence is placed in last position of the current sequence after the sequence switching time has elapsed.
- Sorting: New boiler sequence by means of automatic sorting according to operating hours in the event of sequence change (sequence change according to operating hours of the first heat generator of the active sequence).

**Time Seq-Mod *)** (time to sequence change)

For operation with at least 2 heat generators there is the option to swap the boiler sequence after the operating hours specified here of the first heat generator of the active sequence.

00 = no HS Sequence

**Block-Time *)** (delay time for next stage)

Min. delay time after switching on or with switching HS, also when switching a layer off until switching the next layer on.

***!*** 00 = 10 sec; For correct settings, also ensure the internal Block-Time for the closed burner control.

***) These parameters can be additionally set in the menu Heat generator adjustable**

## Set values for modulation control

(only for one-stage modulating boilers)

| Modulation | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| Min Mod HS | 00 – 100% | 00 | |
| Dyn Upward | 20 – 500 K | 100 K | |
| Dyn Downward | 20 – 500 K | 100 K | |
| Use the F button [End] to exit the level | | | |

### Min Mod HS

If the controller calculates an overall modulation rate greater than zero and less than "min Mod HS," the overall modulation rate is set to the value "min Mod HS." The Block-Time is simultaneously set to 10s.

### **Dyn Upward** (dyn. heat generator connection [K])

Small value = fast high-modulate
Large value = slow high-modulate

⚠ Values set too low can lead to overheating of the HS and triggering the STB.

Calculation: If the cumulative system deviation in Kelvin reaches the set value A, the effect this is the modulation of 100%

### Dyn Downward (dynamic heat generator deactivation [K])

Small value = fast deactivation
Large value = slow deactivation

⚠ Values set to high can lead to overheating of the HS and triggering the STB

Calculation: Reaches the summed rule difference in Kelvin the adjusted value, thus this causes the disconnection of all HS.

## Set values for buffer storage

| Buffer | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| T-Buffer Charge | 40°C – 90°C / OFF/Requirement | Requirement | |
| Min T-Buffer | 10°C – 90°C | 10°C | |
| Use the F button [End] to exit the level | | | |

### T-Buffer Charge

Temperature to which the buffer storage must be charged at the sensor "sensor middle".
Sensor "buffer top" = Terminal 6 operates on "HS Off".

Parameter value = OFF:

In this setting the buffer will not load by the conventional heat generator. The feeler "Buffer M " is not used. The use occurs, e.g., through MF functions like [return flow temperature increase] or [transfer pump for buffer storage].

Parameter value = Requirement:

The requirement (e.g. heat slope) derived from max. value formation + 5K hysteresis operates on sensor "buffer middle".

Parameter value >= 40°C <=90°C:

The set value + 5K hysteresis operates on sensor "buffer top".

### Min T-Buffer

When this function is active, the "buffer upper" sensor limits the heat emission for the heating circuits in the range below the minimum buffer temperature.
The heating circuit pumps are switched Off.
Switching off the heating circuits only occurs if: Outside temperature > frost protection temperature.

### Set value for cooling mode

(only when HS type = cooling is selected)

If a refrigerating machine is present, cooling mode can be activated using the operating mode selector switch. The refrigerating machines are regulated to the return flow temperature [T-Return cooling] (switching hysteresis 2K).

| Cooling operation | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| T-Return cooling | 5°C – 25°C | 15°C | |
| Use the F button [End] to exit the level | | | |

### Set values for 0-10V Input / Output

If the controller assigns the HS with the set temperature through a voltage input, the 0-10V output on the controller can be adjusted using the following parameters on the voltage input of the HS.

If the 0-10V input of the controller is used for a temperature requirement, the evaluation of the current signal is defined using the same parameters.

**Important set values for 0-10V I/O**

Configuration/HS1 BUS = 04 => Output of the temperature setting of the heat generator via the 0-10V output signal.
Configuration/HS1 BUS = 05 => Output of the set modulation depth via the 0-10V output signal.
Configuration / F15 Function = 01 => Evaluation of the preset external header temperature setting via the 0-10V output signal.
Configuration/F15 function = 03 => Evaluation of the preset external modulation depth via the 0..10V input.

| 0-10V I/O | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| V-CURVE | 00 - 11 | 00 | |
| CURVE 11-U1 | 0.00V – 10.00V | 4.00 | |
| CURVE 11-U2 | 0,00V – 10.00V | 0,10 | |
| CURVE 11-T1 | 00°C - 120°C | 20 | |
| CURVE 11-T2 | 00°C - 120°C | 90 | |
| Curve 11-UO | 0.00V – 10.00V | 5.00 | |
| Use the F button [End] to exit the level | | | |

**Table of voltage curves that can be chosen**

| No. | U1 | U2 | T1 | T2 | UA |
|---|---|---|---|---|---|
| 0 | 2.0 | 10.0 | 0 | 90 | 2.0 |
| 1 | 2.5 | 0.3 | 38 | 80 | 5.0 |
| 2 | 2.5 | 0.3 | 38 | 75 | 5.0 |
| 3 | 2.5 | 0.3 | 38 | 45 | 5.0 |
| 4 | 4.0 | 0.1 | 20 | 85 | 5.0 |
| 5 | 4.0 | 0.1 | 20 | 75 | 5.0 |
| 6 | 4.0 | 0.1 | 20 | 55 | 5.0 |
| 7 | 4.0 | 0.1 | 30 | 87 | 5.0 |
| 8 | 4.0 | 0.1 | 38 | 87 | 5.0 |
| 9 | 4.0 | 0.1 | 38 | 73 | 5.0 |
| 10 | 4.0 | 0.1 | 38 | 53 | 5.0 |
| 11 | 4.0 | 0.1 | 20 | 90 | 5.0 |

### Set values for cooling mode

**T-Return cooling**

In Cooling operating mode, the refrigeration machine is switched on when the temperature set here is exceeded in the return flow at the sensor [F17]. The refrigeration machine is switched off when the temperature at [F17] drops below this temperature [T-Return Cooling – 2K].

### Set values for 0-10V Input / Output

**V-Curve (only for 0-10V input/output)**

One of the defined voltage curves or free-definition curve 11 can be selected here for configuring the voltage input and the voltage output.

**Curve 11-xx (only when V-Curve = 11)**

Using parameters U1, U2, T1, T2 and UA, a special voltage curve can be defined.

U = Voltage, T = Temperature, UA = HS OFF
U1, T1 => Point 1 on the voltage curve
U2, T2 => Point 2 on the voltage curve
The line between these limit points defines the voltage curve.
UA => Starting with this voltage, HS = OFF
(UA must lie outside of the valid voltage values)

## Screed program

| Screed | | |
|---|---|---|
| **Designation** | **Value range** | **Standard** |
| Screed | Off/On | Off |
| Screed Program | See explanation! | |
| Use the F button [End] to exit the level | | |

### Preset values

| Day | T-Flow | Own settings |
|---|---|---|
| 1 | 25 | |
| 2 | 25 | |
| 3 | 25 | |
| 4 | 55 | |
| 5 | 55 | |
| 6 | 55 | |
| 7 | 55 | |
| 8 | 25 | |
| 9 | 40 | |
| 10 | 55 | |
| 11 | 55 | |
| 12 | 55 | |
| 13 | 55 | |
| 14 | 55 | |
| 15 | 55 | |
| 16 | 55 | |
| 17 | 55 | |
| 18 | 55 | |
| 19 | 55 | |
| 20 | 40 | |
| 21 | 25 | |
| 23 | -- | |
| 24 | -- | |
| 25 | -- | |
| 26 | -- | |
| 27 | -- | |
| 28 | -- | |

***!*** Start day is not included:
The screed program starts with the "Day 1" temperature setting and switches to "Day 1" at 00.00 hrs and then to the next day at 00.00 hrs and so on. The current day is marked with an "x" in the "Screed Program".

***!*** After the function has been cancelled/terminated the controller continues heating using the set operating mode. If no heating is required, set the operating mode to ⏻ = Standby / OFF.

### **Screed** (activation of screed drying process)

The screed program can be used for function heating in accordance with DIN 4725 – 4 and for heating freshly laid screed ready for flooring.

***!*** Screed drying can only be carried out for mixer circuits.

After starting, the program runs through the set flow temperatures. The integrated mixer circuits control to the set flow temperature. The boiler provides this temperature irrespective of the operating mode that has been selected. This is marked in the standard display by the entry "SCREED" and a display of the current flow temperature.

The freely adjustable program runs for a maximum of 28 days. The flow temperatures can be set to a value of between 10°C and 60°C for each day. The entry "----" stops the program (also during operation for the following day).

### **Screed Programm** (settings)

F button => Screed Program
⟳ Select day => Temperature is displayed
F button [OK] => Activate the day for the adjustment
⟳ Set the flow temperature;
F button [OK] => Save setting
⟳ => Select Next Day or exit the screed program using the F button [End].

| Hot-Water | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| DHW Relief | Off/On | On | |
| Parallel DHW | Partial DHW, On, Off, Parallel all | Partial DHW | |
| T-HS DHW | 00K – 50K | 20K | |
| Hysteresis DHW | 5K – 30K | 5 K | |
| DHW Followup | 00 min – 30 min | 00 min | |
| Therm Input | Off/On | Off | |
| Wall Hung | Off/On | Off | |
| Load Through | Off/On | Off | |
| Use the F button [End] to exit the level | | | |

**DHW Relief** (DHW Relief)

The charging pump is not switched until the boiler temperature exceeds the storage tank temperature by 5K. It is switched off when the boiler temperature drops below the storage tank temperature. This prevents the storage tank from being cooled by the boiler when hot water preparation starts.

**Parallel DHW** (Pump parallel running)

Partial DHW => Partial priority HW: The heating circuits are blocked during hot water preparation. The mixers close and the heating circuit pumps switch off. The mixer circuits are enabled again when the boiler has reached the temperature of hot water temperature setting + boiler superheating [T-DHW + T-HS DHW]. If the boiler temperature drops below the enable temperature by the switching hysteresis [Hysteresis DHW] again, the mixer circuits are blocked again.

On => Pump parallel running: Only the direct heating circuits are blocked during hot water preparation. The mixer circuits continue to be heated. The hot water preparation is extended by this function.

Off => Warm water priority operation: The heating circuits are blocked during hot water preparation. The mixers close and the heating circuit pumps switch off.

Parallel all => Pump parallel running also for the direct heating circuit: During hot water preparation all heater circuits continue to be heated. The hot water preparation is extended by this function. When the boiler temperature exceeds the maximum flow temperature of the direct heating circuit by 8K, the heating circuit pump for this circuit is switched off (overheating protection). The heating circuit pump is switched on again when the boiler temperature drops below the temperature [maximum flow temperature + 5K].

**T-HS DHW** (increase during HW operation)

Heat generator setting with hot water preparation = hot water temperature setting + T-HS DHW

***!*** The boiler must be run at a higher temperature during hot water preparation so that the hot water temperature in the storage tank can be reached via the heat exchanger.

**Hysteresis DHW** (hot water hysteresis)

Hot water preparation is started when the temperature of the hot water storage tank drops below the temperature setting by the hysteresis [Hysteresis DHW]. The hot water preparation stops when the storage tank reaches the temperature setting (the temperature setting is set to 65°C during hot water short time heating operation).

**DHW Followup** (pump run-down time)

00 min => Standard function: The charging pump continues to run for 5 minutes after the burner has switched off.
If heat is requested by a heating circuit the run-down is cancelled.
The charge pump blocking kicks in and can also cause the run-down function to be cancelled.

greater than 00 min => The charge pump runs down by the set time when storage tank charging is complete. The after-run can only be cancelled by the activated charge pump blocking.

**Therm Input** (storage tank with thermostat)

00 => Hot water preparation via storage tank sensor

01 => Hot water preparation via thermostat:
The hot water preparation is started by a short circuit at the storage tank sensor connecting terminals. It stops when the short circuit is removed.

**Wall Hung** (for modulating HS)

Boiler temperature setting with hot water preparation = hot water actual temperature + T-HS DHW

With this function the exhaust gas losses occurring during hot water preparation can be reduced with modulating heat generator using the adapted boiler temperature setting.

**Load Through** (only with F12 = T-DHW B)

The charge through function can be activated by connecting a hot water storage tank bottom sensor.

T-DHW = Temperature of hot water tank in removal area

Storage tank charging:
ON: T-DHW < T-DHW Rated - Hysteresis DHW
OFF: T-DHW B > T-DHW Rated

The charging process of the storage tank only terminates when the lower storage tank set temperature has been reached.

The parameters in this level change in accordance with the heating circuit function that has been selected [HC FUNCTION]

| **Heatcircuit 1 / 2** | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| HC Function | Standard, T-Circuit Fxd, Pool, HW, Return | Standard | |
| Pump Mode | Standard, Heating limits, Only timeprog, Continuous | Standard | |
| Mixer Open (not for HW circuit) | 5-25 | 18 | |
| Mixer Close (not for HW circuit) | 5-25 | 12 | |
| Max T-Flow | 20°C - 110°C | 80°C | |
| Min T-Flow | 10°C - 110°C | 10°C | |
| T-Flow cooling | OFF, CLOSE, 10°C – 25°C | 15°C | |
| T-Frost protect | ----; (-15)°C – (5)°C | 0°C | |
| Outdoor delay | 0:00 – 24:00 | 0:00 | |
| Slope Offset | 0K – 50K | 5 K | |
| B-Heat Sink | Off/On | On | |
| Use the F button [End] to exit the level | | | |

**HC Function** (heating circuit function selection)

Standard =>favorite heating circuit

T-Circuit Fxd => Control for fixed flow temperatures
During the heating periods (see heating program ) the heating circuit is operated with a fixed preset flow temperature [T-Flow Day], and during reduced mode operation with a fixed preset flow temperature [T-Flow Night] accordingly.

Pool => Pool control (only Heatcircuit 2)
This function can be used to heat a swimming pool. The mixer controls the flow temperature for the swimming pool heat exchanger. The swimming pool water temperature sensor is connected to the room sensor [F15] for the heating circuit (see FBR).
The flow temperature control operates like normal room control [Room Influence].
The set value for the water temperature can be entered in the user area of the associated heating circuit level [T-Pool 1/2/3]. The heating program operates. No heating takes place during the reduction period
The water temperature and the current set value are displayed in the display level [T-Pool / T-Pool Desired].

HW => Hot water circuit
This function can be used to operate additional hot water circuits. The heating circuit flow sensor is located in the hot water storage tank.
The hot water temperature set value can be entered in the user area of the associated heating circuit level [T-DHW 1/2/3]. The heating program for the heating circuit acts as an enable program for the storage tank. The storage tank set value is set to 10°C during the reduction period.
The boiler controller hot water priority function can be used (partial priority acts like priority).

Return flow => Return flow temperature increase via mixer (Heatcircuit 2 only)
The heating circuit flow sensor is used as a boiler return flow sensor. The mixer controls to the heating circuit set value for 24 hours [Min T-Flow].
**Installation tip:** Mixer Open => boiler flow is fed into the return (=> return flow temperature increase)
Mixer Closed => heating circuit return is passed through. When the mixer is open it must be ensured that there is circulation through the boiler (boiler pump).

**Pump Mode** (pump operating modes)

The circulation pumps are switched off if heating is not required. The mixer motors are closed at the same time => "The heating circuit is switched off".

(Switch on with 1K hysteresis)

Standard => Standard circulation pump control
- Room temperature-dependent control

OFF: Room temperature > room set value + 1K
- Weather-dependent control during heating operation

OFF: Outside temperature > room set value
- Weather-dependent control during reduction operation

(Room Influence =0)
OFF: The switch-off occurs during the transition to reduction operation. The pump runs continuously after being switched on.
ON: Room temperature < room set value
(Room Influence = "--")
OFF: Flow temperature setting < 20°C.

Heating limits => Pump switching in accordance with heating limits
- Heating time

OFF: Outside temperature < set heating limit day
- Reduction period

OFF: Outside temperature < set heating limit night

Only timeprog => Pump switching as per heating program
Heating time: Pump is ON; Heating circuit is enabled
Reduction period: Pump is OFF; Heating circuit is blocked

Continuous
The pump runs continuously for 24 hours! The heating circuit is permanently enabled.

**Mixer Open** (open mixer dynamic)

Speed setting at which the mixer opens when a control difference occurs. The control difference at which the mixer opens without interruption is entered in Kelvin.

***!*** Small values cause the mixer to adjust quickly and can lead to oscillation.

**Mixer Close** (close mixer dynamic)

Speed setting at which the mixer closes when a control difference occurs. The control difference at which the mixer closes without interruption is entered in Kelvin.

***!*** Small values cause the mixer to adjust quickly and can lead to oscillation.

**Max T-Flow** (max. flow temperature)

The measured temperature setting for the heating circuit flow is limited to the maximum flow temperature setting (overheating protection).

⚠ The heating circuit pump of the direct heating circuit is not switched off until the boiler temperature exceeds the set maximum flow temperature by 8K. The heating circuit pump is already switched on again when the boiler temperature drops below the temperature [maximum flow temperature + 5K].

**Min T-Flow** (min. flow temperature)

The measured temperature setting of the heating circuit flow is increased to the minimum flow temperature setting (e.g. with air heating).

**T-Flow cooling** (only in installation cooling mode)

In the Cooling operating mode, this temperature is adjusted via the mixer in the heating circuit flow.
OFF = Heating circuit is not cooled (Mixer Close, Pump Off)
CLOSE = Mixer as bypass valve (Mixer Close, Pump On)

**T-Frost protect** (frost protection temperature)

If the outside temperature drops below the programmed value, the system switches to frost protection mode (pumps are switched on).
"----" Frost protection mode is deactivated!

**Outdoor delay** (outside temperature delay)

The selected outside temperature delay must be matched to the type of construction of the building. In the case of heavy structures (thick walls), a long delay must be selected since a change in outside temperature affects the room temperature later accordingly. With light structures (walls have no storage effect) the delay should be set (0 hrs.).

**Slope Offset** (heating slope distance)

The boiler temperature that is required for a mixer circuit is calculated by adding the calculated temperature setting for the heating circuit flow to the heating curve distance. The heating curve distance compensates for sensor tolerances and heat loss up to the mixing valve.

**B-Heat Sink** (circuit enable)

On => The heating circuit can be used by higher-order functions (e.g. emergency cooling function of a heat generator to protect from overheating; heat removal during service mode) as a heat sink/consumer. The heating circuit is heated at the maximum flow temperature setting for the duration of the function.

## Auxiliary relay functions

The multifunction relays = MF relay is assigned one basic function respectively

MF-1: Mixing Valve HC1 OPEN (MF 1 Func = 00)
MF-2: Mixing Valve HC1 CLOSED (MF 2 Func = 00)
MF-3: Collector pump (MF 3 Func = 01)
MF-4: Circulation (time) (MF 3 Func = 02)

If this basic function of a MF relay is not required (configuration of the installation in Installation level), any one of the functions described below may be selected for any unused relay.

The MF-relay 1-4 (A8-A12) is always assigned with a sensor 1-4 (F11-F14) (applies for functions starting from "20" only).
If an additional sensor is required for a function, it should be connected as F15.
The functions that may be selected for the MF relays 1-4 are described using MF relay 1 as an example.

| **Solar/MF** | | | |
|---|---|---|---|
| **Designation** | **Value range** | **Standard** | **IV** |
| MF (1-4) FUNC | 00 - 34 | 00, 00, 01, 02 | |
| T-MF(1-4) Setpoint | 30°C - 90°C | 30°C | |
| MF(1-4) Hyst | 2K – 10K | 5 K | |
| MF(1-4) Hyst Off | 2K – 10K | 2 K | |
| Max T-Solar | 80°C – 180°C | 110°C | |
| Min T-Solar on | -20°C – 95°C | 40°C | |
| Min T-Solar off | -20°C – 95°C | 35°C | |
| T-Solar protect | 80°C – 180°C | 110°C | |
| Rflow cool diff | 0K – 30K | 0 K | |
| Max T-Storage DHW | 10°C – 130°C | 60°C | |
| Max T-Storage BU | 10°C – 130°C | 85°C | |
| Max T-Storage 3 | 10°C – 130°C | 30°C | |
| Sol Kick Period | 0s – 59s | 0s | |
| Sol Kick Pause | 10 – 60min | 30min | |
| Sol Kickgradient | 01 – 05min | 01min | |
| Use the F button [End] to exit the level | | | |

**Must be observed!**

***!*** Operation as 1144:Selectable MF functions => 02, 03,12,13,20,21,24,25,33,34

***!*** Operation as 1144: The circulation pump is not started automatically during the hot water short time heating function.

***!*** If an MF solar function (07, 08, 09, 23, 27, 28, 29) has been activated, another external solar controller may not be connected (for solar function see Installation => Solar installations - Examples)

**MF 1 Func** (function selection relay MF1)

**T-MF1 Setpoint** (switching temperature relay MF1)

**MF1 Hyst** (Switch on hysteresis Relay MF1)

**MF1 Hyst** Off (Switch off hysteresis Relay MF1)

**00 = No MF function**

**01 = Collector pump**
ON: When heat is requested by a consumer
OFF: Without consumer heat request
If at least one consumer in the system requests heat the pump is switched on. The after-run function runs after the burner has been switched on.

**02 = Circulation (time)**
Switching the relay according to the time program for the circulation pump

**03 = Booster pump**
ON: When heat is requested by an internal consumer
OFF: When no heat is requested by an internal consumer. Follow-up pump action occurs.

**05 = Pump HS1**
The relay may be used to control boiler pump for heat generator 1.
(Relay switches with burner relay 1; run-down=5 min)

With buffers in the system (Buffer > 00 and sensor BU): In this case the pump is switched on when the temperature of the heat generator T-HS1 exceeds the temperature T-Buffer T by 5K. The pump is switched off when T-HS1 is less than T-Buffer T.

**06 = Pump HS2**
The relay may be used to control boiler pump for heat generator 2.
(Relay switches with burner relay 2; run-down=5 min)

**07 = Switch-over valve Storage 2 (buffer)**
The valve changes solar production over from hot-water tank to buffer storage if it is not possible for any more collectors to feed the hot-water tank.

**08 = Switch-over valve Storage 3 (swimming pool)**

***!*** The F15 function must stand on 5.

The valve changes solar production over from buffer storage to storage tank 3 [F15] if it is not possible for any more collectors to feed the buffer storage.

**09 = Switch-over valve Storage 3 (swimming pool)**

***!*** The F15 function must stand on 5.

(only for systems without solar buffer charging)
The valve switches the solar production from the hot-water tank to Storage 3 [F15] as soon as no collector is able to charge into the hot-water tank.

**12 = Remote-controlled output Heatcircuit 1**
The relay can be switched from the control unit of the heating circuit via the BUS (for function, refer to control unit manual).

**13 = Remote-controlled output Heatcircuit 2**
The relay can be switched from the control unit of the heating circuit via the BUS (for function, refer to control unit manual).

**20 = Temperature-controlled circulation pump**
T-CIRCL = Return flow temperature of circulation line
ON: T-CIRCL < T-MF1 SETPOINT
OFF: T-CIRCL > [T-MF1 SETPOINT + MF 1 HYST]

The circulation pump is switched on when the return flow temperature drops below the temperature setting limit (T-MF1 SETPOINT). The pump is switched off again when the return flow temperature exceeds the set limit temperature by the Hysteresis (MF 1 HYST).
The set circulation program and the "Circulation with hot water" setting have an overriding function
=> Switching on only takes place during enable periods.

**21 = Pulsed circulation pump**
ON: With short circuit at assigned sensor input
OFF: After 5 minutes
If a short-cut occurs at the multifunction sensor input the circulation pump is switched on for 5 minutes. Switching on takes place on the edge (once only).
The set circulation program and the "Circulation with hot water" setting have an overriding function
=> Switching on only takes place during enable periods.

**22 = Solid fuel boiler integration**
(e.g. in connection with 2-stage HS)
T-MF1 or 1-4 = Temperature of the solid fuel boiler
T-BUFFER B = Temperature of buffer storage in the infeed area [F1]
ON: T-MF1 > [T-BUFFER B (F1) +MF 1 HYST + 5K]
OFF: T-MF1 < [T-BUFFER B (F1) + MF 1 HYST]

Warm Up Temp:
ON: T-MF1 > T-MF1 SETPOINT
OFF: T-MF1 < [T-MF1 SETPOINT – 5K]

The pump is switched on when the temperature of the solid fuel boiler exceeds the temperature of the buffer storage in the infeed area [T-BUFFER B (F1)] by the hysteresis [MF 1 HYST+ 5K]. Switching off occurs when the temperature drops 5K below the switch-on-temperature.

Switching off also occurs when the temperature of the solid fuel boiler drops below the set limit temperature [T-MF1 SETPOINT] by 5K. The pump is enabled again when the temperature of the solid fuel boiler exceeds the set limit temperature [T-MF1 SETPOINT].
Blocking HS1:

ON: T-MF1 > HS set temperature + 5K and solid-fuel boiler pump = ON
OFF: T-MF1 <= HS set temperature or solid-fuel boiler pump = OFF

**23 = Collector pump**
**(pump is operational as soon as the collector is able to charge one of the solar storage tanks)**

***!*** Collector 1 pump only at MF4 because of sensor assignment and PT 1000

***!*** Collector 2 pump only at MF3 because of sensor assignment and PT 1000

***!*** At MF1 and MF2, this function can be used to charge the storage tank from a heat exchanger (without PT 1000 sensor)

T-SOLAR = Temperature of the solar collector
T-B = Temperature of active storage tank at inlet area
T-T = Temperature of active storage tank in upper area
ON: T-SOLAR > [T-B + MF HYST]
OFF: T-SOLAR < [T- B + MF HYST OFF]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the active storage tank (see switch-over valves) in the infeed area by the switch on hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-B + MF HYST OFF].
A check is conducted before switch-off as to whether a secondary storage tank (see switch-over valves) can be fed.

Safety / system protection:
Please See “Max T-Solar” and “T-Storage DHW, BU, 3”.

**24 = Return flow temperature increase HS1**
T-RETURN 1 = Return flow temperature from the installation [= T-MF1 or 1-4].
ON: T-RETURN 1 < T-MF1 SETPOINT
OFF: T-RETURN 1 > [T-MF1 SETPOINT +MF 1 HYST]

The return flow temperature increase pump is switched on if the return flow temperature drops below the temperature setting limit (T-MF1 SETPOINT). It is switched off again when the return flow temperature exceeds the temperature setting limit by the Hysteresis (MF 1 HYST).

**25 = Return flow temperature increase HS2**
T-RETURN 2 = Return temperature of system
ON: T-RETURN 2 < T-MF1 SETPOINT
OFF: T-RETURN 2 > [T-MF1 SETPOINT +MF 1 HYST]

The return flow temperature increase pump is switched on if the return flow temperature drops below the temperature setting limit (T-MF1 SETPOINT). It is switched off again when the return flow temperature exceeds the temperature setting limit by the Hysteresis (MF 1 HYST).

**26 = Return flow temperature increase HS via buffer storage**
ON: T-BUFFER B [F1] > T-MF1 +MF 1 HYST + 5K
OFF: T-BUFFER B < T-MF1+MF 1 HYST

The valve to the return flow temperature increase via the buffer storage is opened if the temperature buffer storage low [T-BUFFER B] exceeds the return flow temperature of the installation [sensor ≀ 1 or 1-4] by the Hysteresis (MF 1 HYST + 5K). It is switched off again when the temperature buffer storage low drops below the return flow temperature.

**27 = Storage charging pump 1**
**(pump operates when the hot-water tank can be charged by the solar system)**

***!*** The temperature of the medium used for charging the storage tank is always measured at the MF4 sensor [T-MF4]. Exception: In the case of function [23] at MF4, the sensor assigned to the MF relay storage charging pump 1 is used to determine the temperature of the medium used for charging the storage tank [T-SOLAR].

T-SOLAR [T-MF4] = Temperature of the solar collector
T-SOLAR [T-MF 1-3] = Temperature of the heat exchanger
T-DHW B [F12]= Temperature of hot water storage tank in infeed area
ON: T-SOLAR >
[T-DHW B + MF HYST]
OFF: T-SOLAR <
[T-DHW B + MF HYST OFF]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the storage tank in the infeed area (T-DHW B) by the Hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-DHW B + MF HYST OFF].

Safety / system protection:
Please See “Max T-Solar” and “T-Storage DHW”.

**28 = Storage charging pump 2**
**(pump operates when the buffer storage tank can be charged by the solar system and the hot-water tank can not be charged by the solar system)**

***!*** The temperature of the medium used for charging the storage tank is always measured at the MF4 sensor [T-MF4]. Exception: In the case of function [23] at MF4, the sensor assigned to the MF relay storage charging pump 2 is used to determine the temperature of the medium used for charging the storage tank [T-SOLAR].

T-SOLAR [T-MF4] = Temperature of the solar collector
T-SOLAR [T-MF 1-3] = Temperature of the heat exchanger
T-Buffer B [F1] = Temperature of buffer storage in the infeed area
ON: T-SOLAR >
[T-Buffer B + MF HYST]
OFF: T-SOLAR <
[T-Buffer B + MF HYST OFF]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the storage tank in the infeed area (T-Buffer B) by the Hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-Buffer B + MF HYST OFF].

Safety / system protection:
Please See “Max T-Solar” and “T-Storage BU”.

**29 = Storage charging pump 3**
**(pump operates when the storage tank 3 can be charged by the solar system and the buffer storage tank can not be charged by the solar system)**

***!*** The F15 function must stand on 5.

***!*** The temperature of the medium used for charging the storage tank is always measured at the MF4 sensor [T-MF4]. Exception: In the case of function [23] at MF4, the sensor assigned to the MF relay storage charging pump 3 is used to determine the temperature of the medium used for charging the storage tank [T-SOLAR].

T-SOLAR [T-MF4] = Temperature of the solar collector
T-SOLAR [T-MF 1-3] = Temperature of the heat exchanger
T-Storage 3 [F15]= temperature of storage tank 3 in the infeed area
ON: T-SOLAR<
[T-Storage 3 + MF HYST]
OFF: T-SOLAR <
[T-Storage 3 + MF HYST]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the storage tank in the infeed area (T-Storage 3) by the Hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-Storage 3 + MF HYST OFF].

Safety / system protection:
Please See “Max T-Solar” and “T-Storage 3”.

**30 = Transfer pump DHW storage tank II**

***!*** The F15 function must stand on 4.

Relay switches when the temperature of the hot-water storage tank exceeds the temperature F15 by the hysteresis (MF HYST ). Switching off occurs when the temperature drops below the temperature [F15 + MF HYST OFF].

**31 = Transfer pump buffer storage tank II**

***!*** The F15 function must stand on 4.

Relay switches when the temperature of the buffer storage tank exceeds the temperature F15 by the hysteresis (MF HYST ). Switching off occurs when the temperature drops below the temperature [F15 + MF HYST OFF].

**32 = Direct heating circuit**
Heating circuit with fixed flow temperature => T-MF Des
In the event of a short circuit at the assigned MF sensor (via room thermostat/timer switch)
=> Heating circuit pump ON
=> Preset desired flow temperature to the HS
After the sensor short circuit has been eliminated, a run-on time takes effect on the pump.

**33 = Thermostat function**
ON: T-MF > T-MF DES
OFF: T-DHW < [T-MF DES – 5K]

**34 = Bypass valve cooling mode**
The relay is switched in cooling mode
=> separation of the conventional HS from the cooling circuit.
=> This means hot water preparation during cooling operation is possible (the flow temperature for the HS control is captured by the MF sensor).

**Max T-Solar**

The collector pumps are disabled when the associated collector temperature exceeds the safety threshold set here -> System protection. The pumps are reactivated when the temperature falls below the temperature [maximum collector temperature – 10K].

**Min T-Solar ON**

The collector pump is enabled when the associated collector temperature exceeds the temperature [Min T-Solar ON].

**Min T-Solar OFF**

The collector pump is disabled when the associated collector temperature drops below the temperature [Min T-Solar OFF]. This function prevents pump operation without relevant heat production.

**T-Solar protect**

The collector protection temperature protects the collector against overheating. If the collector temperature exceeds the set collector protection temperature and the storage tank temperature is less than 92°C, then the storage tank is fed beyond its maximum temperature to 95°C to cool the collector. The function is interrupted when the collector exceeds its maximum temperature. The function is activated again when the collector temperature drops below the maximum temperature-3K.

**Rflow cool diff**

Parameter = 0 => No storage tank recooling

If the collector protection function has fed the storage tanks during the day to temperatures in excess of the set maximum storage tank temperatures, then the storage tank can automatically be cooled at night between 1.00 and 6.00 hours by activating this function by switching on the feeding pumps to the set maximum temperature of the storage tank. The storage tank cannot be fed during this period. Recooling can take place only when the temperature of the storage tank exceeds the collector temperature at least by the value of return flow cooling difference +3K hysteresis.

**Max T-Storage DHW, BU, 3**

If a top of tank sensor is installed, it is used to monitor the maximum temperature at this sensor. If this sensor is not installed, the maximum storage tank temperature is monitored at bottom storage tank sensor. In this case, the layering of the tank must be taken into account. The feeding pumps are disabled when the temperature of the storage heater exceed the safety limit temperature set here.

System protection: The pumps are reactivated when the temperature falls below the temperature [maximum storage temperature – 5K].

**Sol Kick Period [sec]**

Collector pump runtime following pump kick.

**Sol Kick Pause [min]**

If the collector pump has not run for the duration set here, the pump is activated for the kick duration period.

**Sol Kick Gradient [min]**

The course of the collector temperature is controlled during this period following a pump kick. If an increase of 0.5K is detected, the pump is started for a further minute.

# Part 3: General function description

## Heating circuit control

### Weather-dependent control

The boiler or flow temperature is determined via the set heat slope to suit the measured outside temperature in such a way that the set value for the room is approximately set if the heating system is configured correctly.

=> Exact setting of the heat slope is extremely important for weather-dependent control.

The circulation pump is controlled weather-dependently. The circulation pump is switched on if there is a heating demand and in Frost-protection mode.

### Room sensor influence

The current room temperature can be included in computation of the required flow temperature via a present room temperature sensor.

The influence factor (parameter list) can be set between 0 (fully weather-dependent regulation) and 20 (room temperature regulation with minimal outdoor temperature influence). Position "----" deactivates room temperature control. Positions "----" and "0" indicate differences for demand-dependent circulation pump control.

## Hot water generation

The programmed hot water temperature is stabilised by switching the hot-water storage charging pump and the burner. Storage tank charging starts when the storage tank temperature drops below the temperature setting by 5K. Storage tank charging stops when the temperature setting is reached.

## BoB => operation without burner

For operation with solar energy for instance. In this operating mode the burner is only enabled when values drop below the set tolerance limit.

## Frost protection function

The frost protection circuit prevents the heating system from freezing by automatically switching heating operation on.

Outdoor sensor frost protection

If the measured outside temperature drops below the set frost protection temperature the room temperature setting is set to 5°C for the relevant heating circuit. The heating circuit is enabled:

- the pumps are switched on
- the heat request is sent to the boiler

"----" => outdoor sensor frost protection deactivated

The function stops when the outside temperature increases to 1K above the frost protection temperature setting.

Boiler frost protection

The boiler frost protection is activated when the boiler temperature drops below 5°C. The boiler is switched on until the boiler temperature exceeds the "Min T-HS1".

Flow or storage tank sensor frost protection

The sensor frost protection is activated when the flow or storage tank temperature drops below 7°C. Only the relevant pump is switched on.

The sensor frost protection is deactivated when the flow or storage tank temperature increases to above 9°C.

Frost protection via room sensor

If the room temperature drops below 5°C the frost protection function is activated.

The room temperature setting for the relevant heating circuit is set to 5°C. The heating circuit is enabled:

- the pumps are switched on
- the heat request is sent to the boiler

## eBUS burner controls

The controller supports the operation of burner controls via the implemented eBUS. The unit is connected by means of the Terminals (FA eBUS).

Heat request: Controller => Burner / FA

05h07h [in data byte 7 = Process water desired value the burner must not interpret bit 7] additionally

Data/Status: Burner/FA => Controller

05h03h

Requirements for operation:

The burner control unit (FA) must transmit a valid eBUS message.
The eBUS supply must be activated if the burner does not also supply the BUS => Expert/System (tap without information => Test function with and without eBUS supply)

## EEPROM check

Every 10 minutes, a check is conducted automatically in order to establish whether the settings of the controller lie within the specified limits. If a value is found to be out-of-range, it is substituted by the related default value. The range transgression is indicated the error number 81.

In this case, the user should check the important settings of the controller. The error message goes out after the unit is restarted (RESET).

## Circulation pump control

### Switched according to heating requirement

Demand-dependent circulation pump control (automatic summertime switchover) switches the circulation pumps off if there is no heating demand. The mixing valves are closed at the same time.

**Conditions for switch-off:**

Room temperature-dependent control

The room temperature exceeds the set desired temperature.

Weather-dependent control

Outside temperature exceeds room temperature set value or flow temperature set value drops below 20°C.

***!*** If the room temperature factor is "0", the pump continues to run during the reduced operation period after a one-off heating demand.

**Switched according to heating limits**

If the outside temperature that is measured and calculated by the controller exceeds the heating limit specified here, heating is disabled, the pumps switch off and the mixer valves are closed. The heating is enabled again when the outside temperature drops below the set heating limit by 1K (= 1°C).

T-Limit Day => applies during heating times
T-Limit Night => applies during reduction times

**Delayed pump switch-off**

In the case of switch-off of the circulation pumps, the circulation pumps are not switched off until 5 minutes later if one of the burners was on during the last 5 minutes before the switch-off instant.

**Pump blocking protection**

The controller effectively prevents the pumps blocking following longer periods out of operation. The integrated protection function switches on all pumps which have not been in operation during the past 24 hours for 5 seconds at 12.00 hours every day.

**Mixer motor blocking protection**

If the mixer has not moved for 24 hours it is fully opened at approximately 03:00 hrs. (once only). The heating circuit pump is switched off during this time. The maximum flow temperature is monitored. Cancelled at maximum flow temperature – 5K.

## Cooling operation

If a refrigerating machine is present, cooling mode can be activated using the operating mode selector switch. => Hot water loading is only possible by means of the conventional heat generators.

If a bypass valve for cooling operation (MF) is activated, the bypass valve is switched in the Cooling operational mode.

The refrigerating machines and associated HS pumps are switched on when required by the heating circuits until the return flow temperature has fallen below the desired temperature [T-Return cooling]. The switching hysteresis is 2K.

**T-Flow cooling** (only in installation cooling mode)

In the Cooling operating mode, this temperature is adjusted via the mixer in the heating circuit flow.
OFF = Heating circuit is not cooled (Mixer Valve Closed, Pump Off)
CLOSE = Mixer valve as bypass valve (Mixer Valve Closed, Pump On)

The heating circuits reverse the adjustment of the mixing valve. When enabled, the mixer controls the temperature to the temperature [T-Flow cooling] (see description of parameters).
The pumps are switched according to the parameters set for heating operation. With room control, regulation occurs according to the temperature [T-Room cooling].

Weather-dependent cooling:
Cooling mode is enabled when the set outside temperature [Min TO cooling] is exceeded. Cooling operation is set again 1K below the limit temperature.

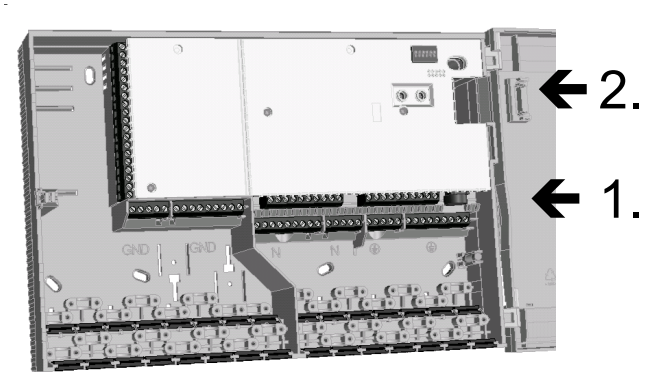
Room temperature-dependent cooling:
Cooling operation (heating circuit enabling) is enabled when the temperature [T-Room cooling] is exceeded. Cooling operation ends 2K below the set temperature.

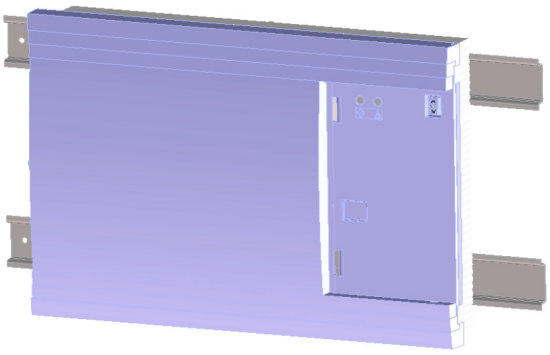
# Part 4: Installation and Start-up

## *Installation*

### Assembly / Dismantling

Open/close ➔



**Installing the controller:**

Wall mounting

Bore hole according to the bore plan and insert dowels. Screw the screw into the bore hole "upper middle" up to a distance of 8 mm from the wall.

Hang the controller housing on this screw.

**Opening the controller housing cover**: To do this, loosen the screw on the left side of the controller housing. And pull the cover on the left side forward.

Align the controller and screw in the fastening screws.

Top hat rail mounting

The device can be mounted in the middle of a top hat rail. In order to increase stability, mounting on two top hat rails is recommended.

Hang the controller on the upper top hat rail with the receiver for the controller and snap it into place on the lower top hat rail. When snapping it into place for support, pull the locking device up using a screw driver (or when mounting on one top hat rail, pull down the corresponding locking device).

**Removing the controller:**

Before removing the controller, it must be ensured that the controller is completely voltage free => disconnect it from the network.

Only replacement of electronics

1. Remove the controller by pulling on the right side, then open the controller cover.

⚠ For a fixed controller: Open the cover of the controller housing and loosen the fastening screws on the back. Then remove the controller on the right side.

2. Loosen the connection board for the control device from the backside of the cover.
3. Loosen the board cover.
4. Remove the board and the pull out the connectors downwards.

Mounting in the opposite sequence.

For wall mounting

- Open the controller housing cover
- Loosen the wiring–if available
- Loosen the fastening screws (see bore plan)
- Push the controller upwards a bit and then remove it towards the front

For top hat rail mounting

- Open the controller housing cover

For mounting with one top hat rail:

- Pull the left locking device downwards with a screw driver and, at the same time, gently remove the controller from the wall on the bottom.
- Remove the controller upwards.

For mounting with two top hat rails:

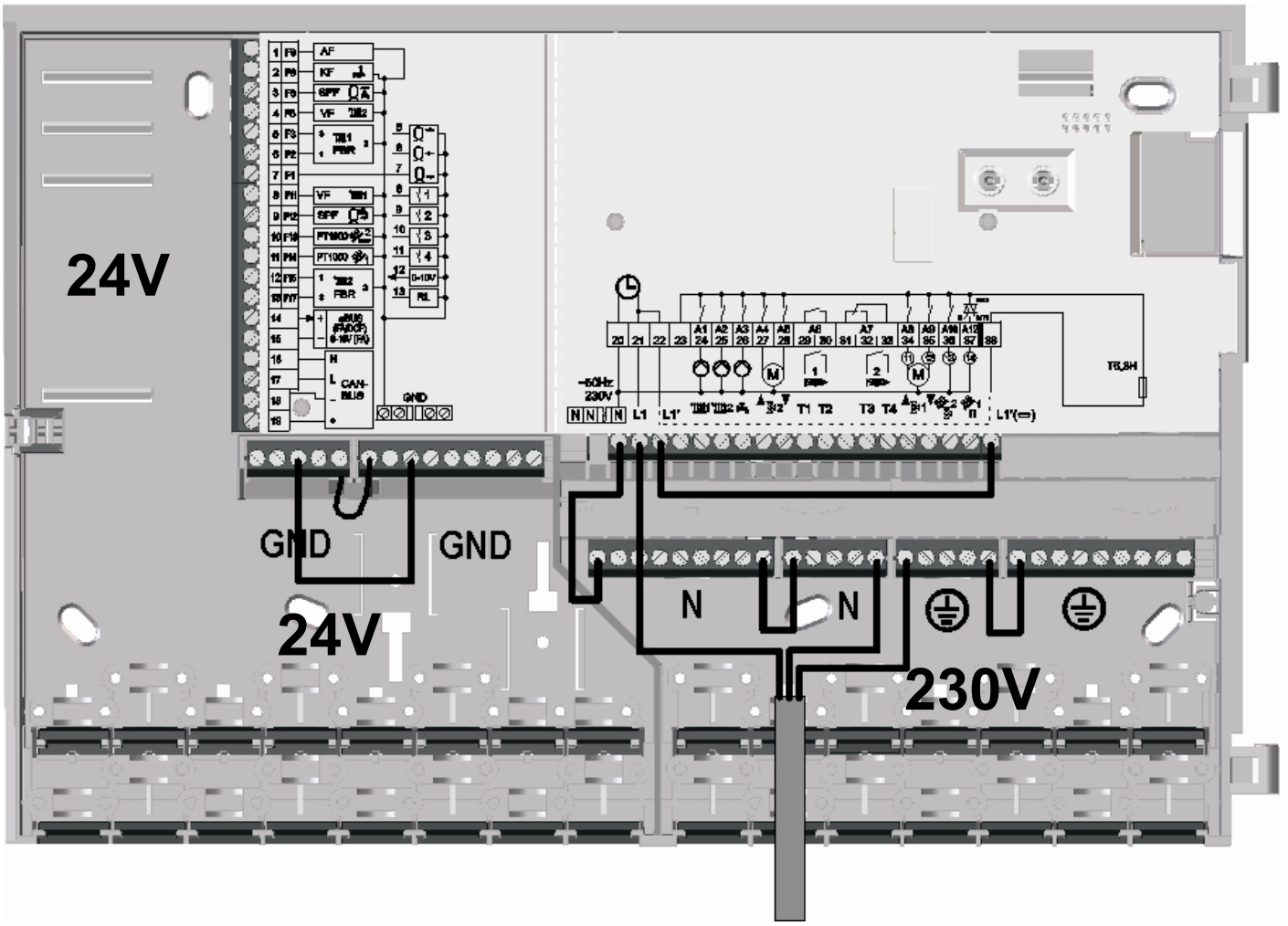
- Pull the right locking device upwards with a screw driver and, at the same time, gently remove the controller from the wall on the bottom.
- Remove the controller upwards.

## Connecting instructions

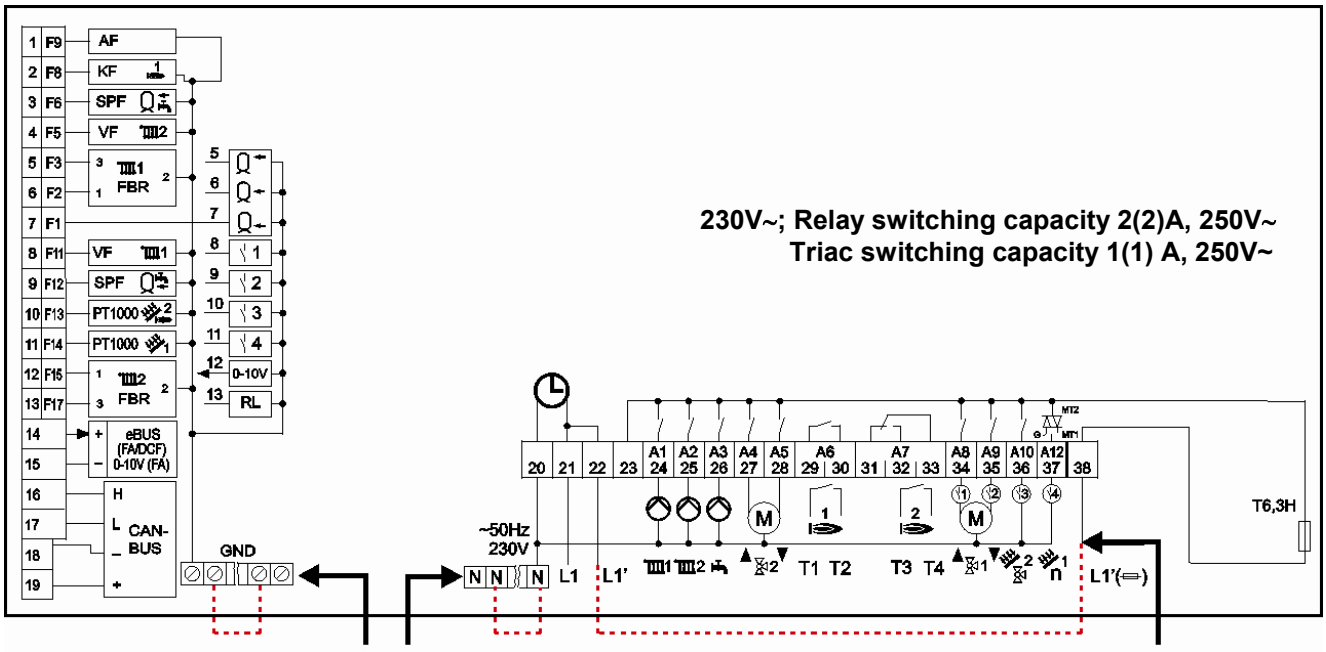
⚠ The controller is designed for an operating voltage of 230 V AC at 50 Hz. The burner contact is potential-free and must always be connected in series with the mechanical boiler thermostat (if present).

⚠ Attention: Bus lines and sensor lines are to be installed separately from supply lines!

***!*** After connecting or modifying the connections of sensors and remote controls the controller must be briefly switched off (mains switch/fuse). The function of the controller is reconfigured in accordance with the connected sensors the next time the controller is switched on.



## Connection diagram




**Establish bridge from terminal 22 to 38**

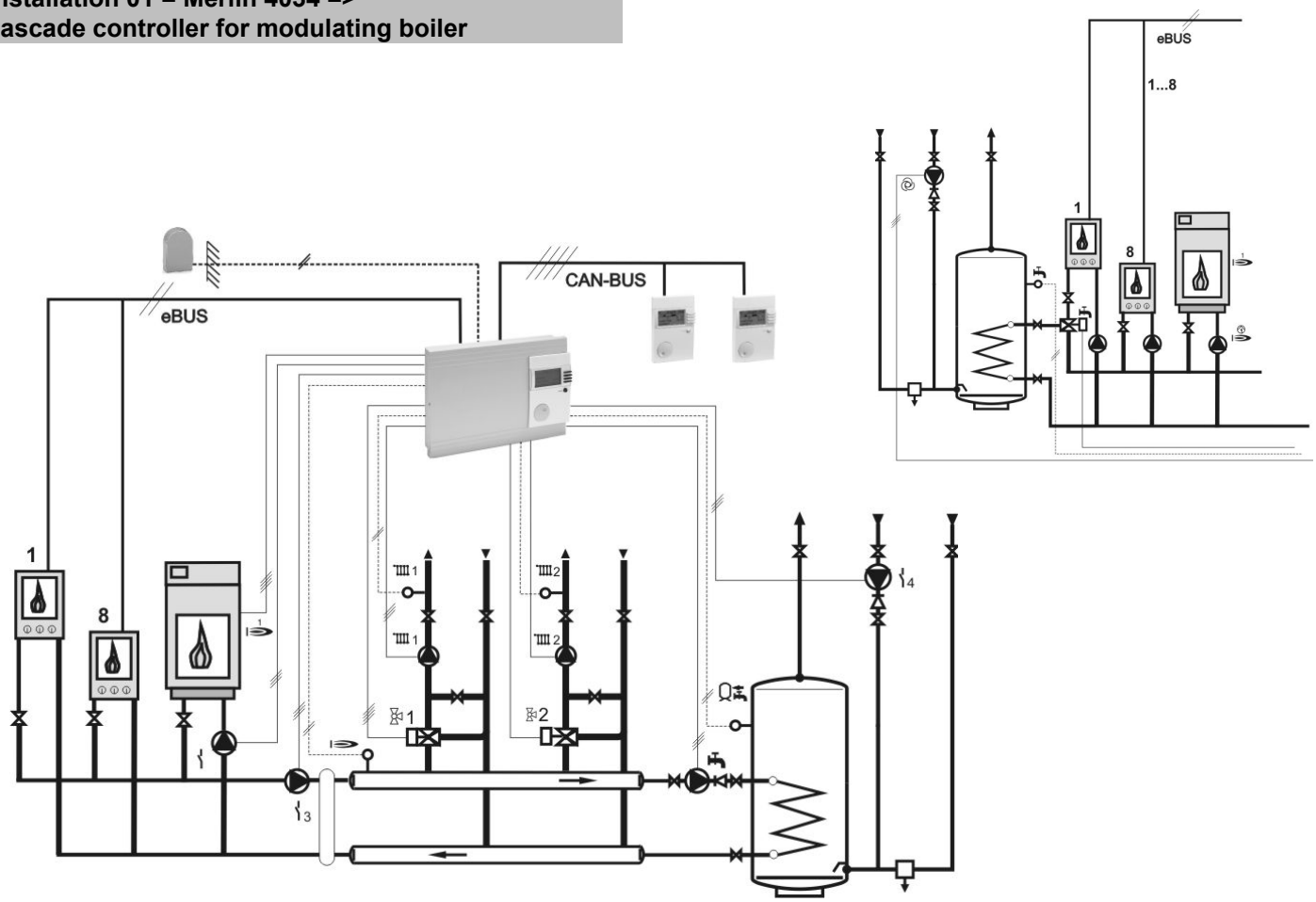
**Establish bridge to the collective terminal block.**
**Connect the collective terminal block with the same potential**

| Pin No. | Sensor No. | | Function 1 | Function 2 | Function 3 |
|---|---|---|---|---|---|
| 1 | F9 | AF | Exterior sensor | | |
| 2 | F8 | KF | Sensor collector/heat generator1 | | |
| 3 | F6 | SPF | Storage tank sensor | | |
| 4 | F5 | VF | Flow sensor HC 2 | | |
| 5 | F3 | FBR Terminal 3 | Room set value/Telephone switch HC1 | Buffer top | |
| 6 | F2 | FBR Terminal 1 | Room sensor HC1 | Buffer middle | |
| 7 | F1 | | Buffer bottom (solar zone) | Buffer bottom | |
| 8 | F11 | VF | Flow sensor HC 1 | Sensor multifunction 1 | |
| 9 | F12 | SPF | Storage tank sensor bottom | Sensor multifunction 2 | |
| 10 | F13 | PT 1000 | Heat generator 2/ Solar collector 2 | Sensor multifunction 3 | |
| 11 | F14 | PT 1000 | Solar collector 1 | Sensor multifunction 4 | |
| 12 | F15 | FBR Terminal 1 | Room sensor HC2 | 0-10V -input | |
| 13 | F17 | FBR Terminal 3 | Room set value/Telephone switch HC2 | Return flow sensor refrigeration machine | |
| 14 | | eBUS + | Combustion machine / DCF | 0-10V + for heat generator | |
| 15 | | eBUS - | Combustion machine / DCF | 0-10V - for heat generator | |
| 16 | H | CAN BUS | High data line | | |
| 17 | L | CAN BUS | Low data line | | |
| 18 | - | CAN BUS | Power supply (measurement) | | |
| 19 | + | CAN BUS | Power supply (+) | | |

## *Choice of installation*

**Installation 01 = Merlin 4034 =>**
**cascade controller for modulating boiler**

Isolating circuit for
hot water preparation




### Terminal assignment

**Sensors**

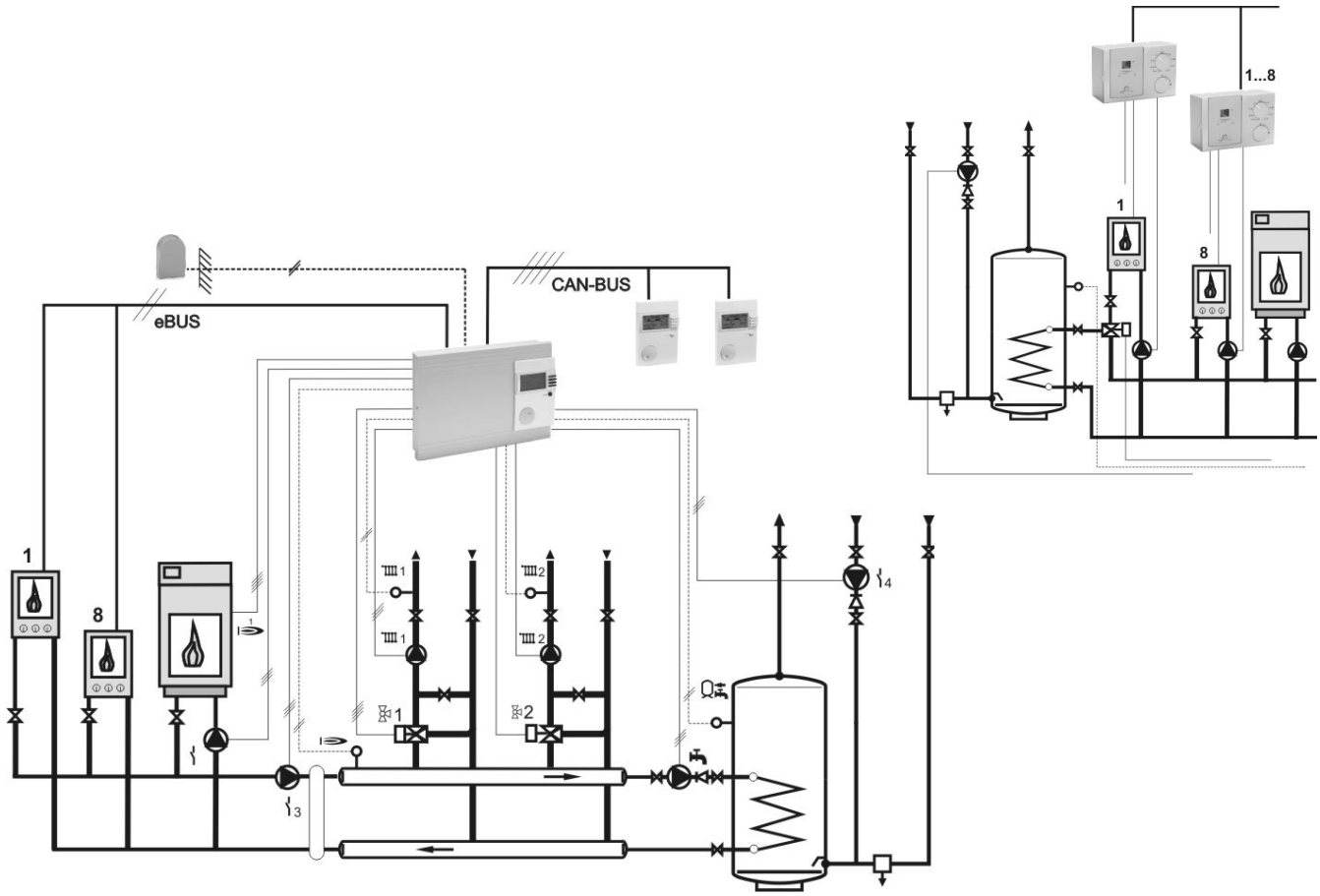
| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | Collector sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND+6 | Optional FBR2 (FBR1) for Heatcircuit 1 |
| 6+GND | Optional room sensor for Heatcircuit 1 |
| 7+GND | - - - - |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Optional hot-water tank bottom |
| 10+GND | Optional multifunction relay sensor 3 (PT1000; but not for collector pump) |
| 11+GND | Optional multifunction relay sensor 4 (PT1000; but not if circulation [time] applies) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | eBUS (to the heat generators/FA/DCF) |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 26 | Storage charging pump |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 29+30 | Additional switching HS |
| 32 | (Bridge 33 to 22) Pump, additional switching boiler |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | Collector pump |
| 37 | Circulation pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 02 = Merlin 4834 =>**
**cascade controller for switching boiler**

Isolating circuit for
hot water preparation




**Terminal assignment**

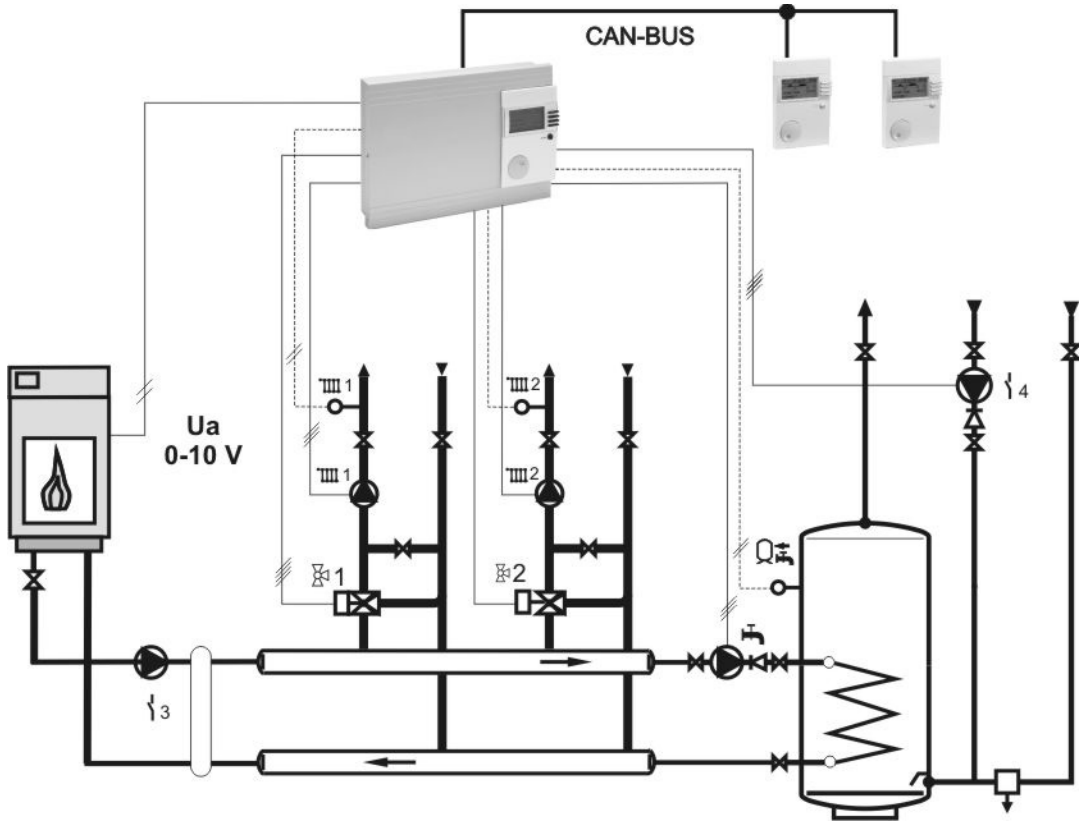
**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | Collector sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND+6 | Optional FBR2 (FBR1) for Heatcircuit 1 |
| 6+GND | Optional room sensor for Heatcircuit 1 |
| 7+GND | - - - - |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Optional hot-water tank bottom |
| 10+GND | Optional multifunction relay sensor 3 (PT1000; but not for collector pump) |
| 11+GND | Optional multifunction relay sensor 4 (PT1000; but not if circulation [time] applies) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | eBUS (to the heat generators/FA/DCF) only heat generators over eBUS |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 26 | Storage charging pump |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 29+30 | Additional switching HS |
| 32 | (Bridge 33 to 22) Pump, additional switching HS |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | Collector pump |
| 37 | Circulation pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 03 = Merlin 3611 => 0-10V controller**




**Terminal assignment**

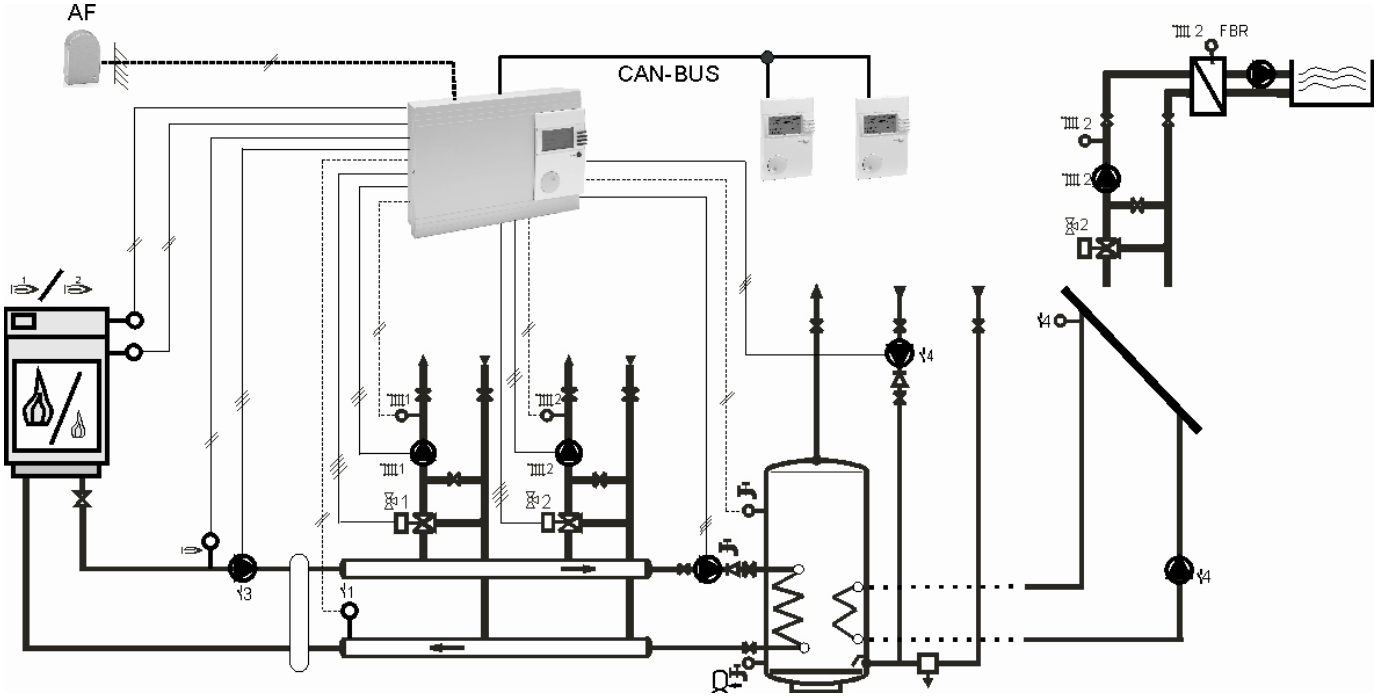
**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | Optional HS sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND+6 | Optional FBR2 (FBR1) for Heatcircuit 1 |
| 6+GND | Optional room sensor for Heatcircuit 1 |
| 7+GND | - - - - |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Optional hot-water tank bottom |
| 10+GND | Optional multifunction relay sensor 3 (PT1000; but not for collector pump) |
| 11+GND | Optional multifunction relay sensor 4 (PT1000; but not if circulation [time] applies) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | 0-10V Output to boiler |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 26 | Storage charging pump |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | HS1 Pump |
| 37 | Circulation pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 04 = Merlin 0634 =>**
**Standard controller with 2-stage HS**




**Terminal assignment**

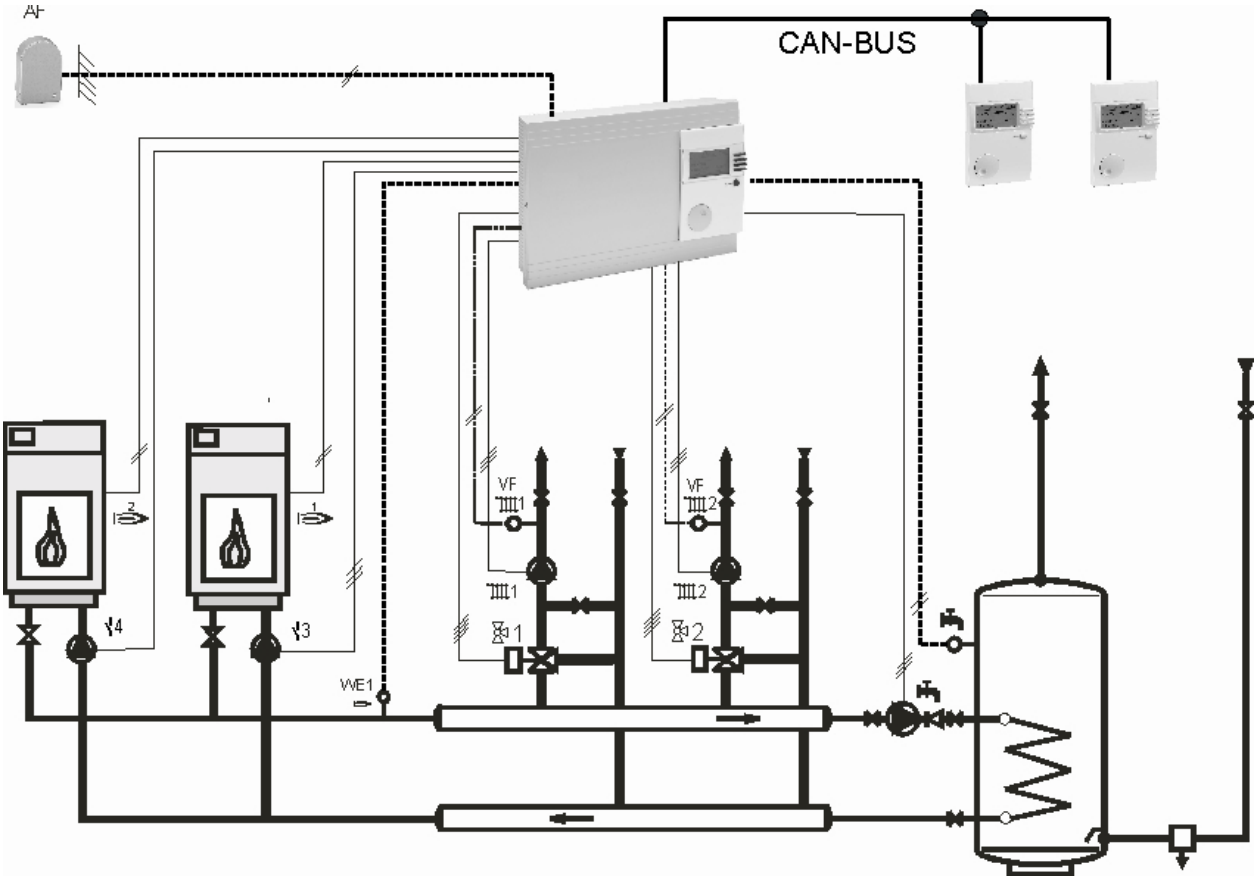
**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | HS sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND+6 | Optional FBR2 (FBR1) for Heatcircuit 1 |
| 6+GND | Optional room sensor for Heatcircuit 1 |
| 7+GND | - - - - |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Optional hot-water tank bottom |
| 10+GND | Optional multifunction relay sensor 3 (PT1000; but not for HS1 Pump) |
| 11+GND | Optional multifunction relay sensor 4 (PT1000; but not if circulation [time] applies) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | Optional eBUS DCF |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 26 | Storage charging pump |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 29+30 | HS1 / Module 1 |
| 32+33 | HS1 / Module 2 (directional contact) |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | Collector pump |
| 37 | Circulation pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 05 = 2HS controller =>**
**2 HS cascade switched via relay**




**Terminal assignment**

**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | Collector sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND+6 | Optional FBR2 (FBR1) for Heatcircuit 1 |
| 6+GND | Optional room sensor for Heatcircuit 1 |
| 7+GND | - - - - |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Optional hot-water tank bottom |
| 10+GND | - - - - |
| 11+GND | - - - - |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | Optional eBUS DCF |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

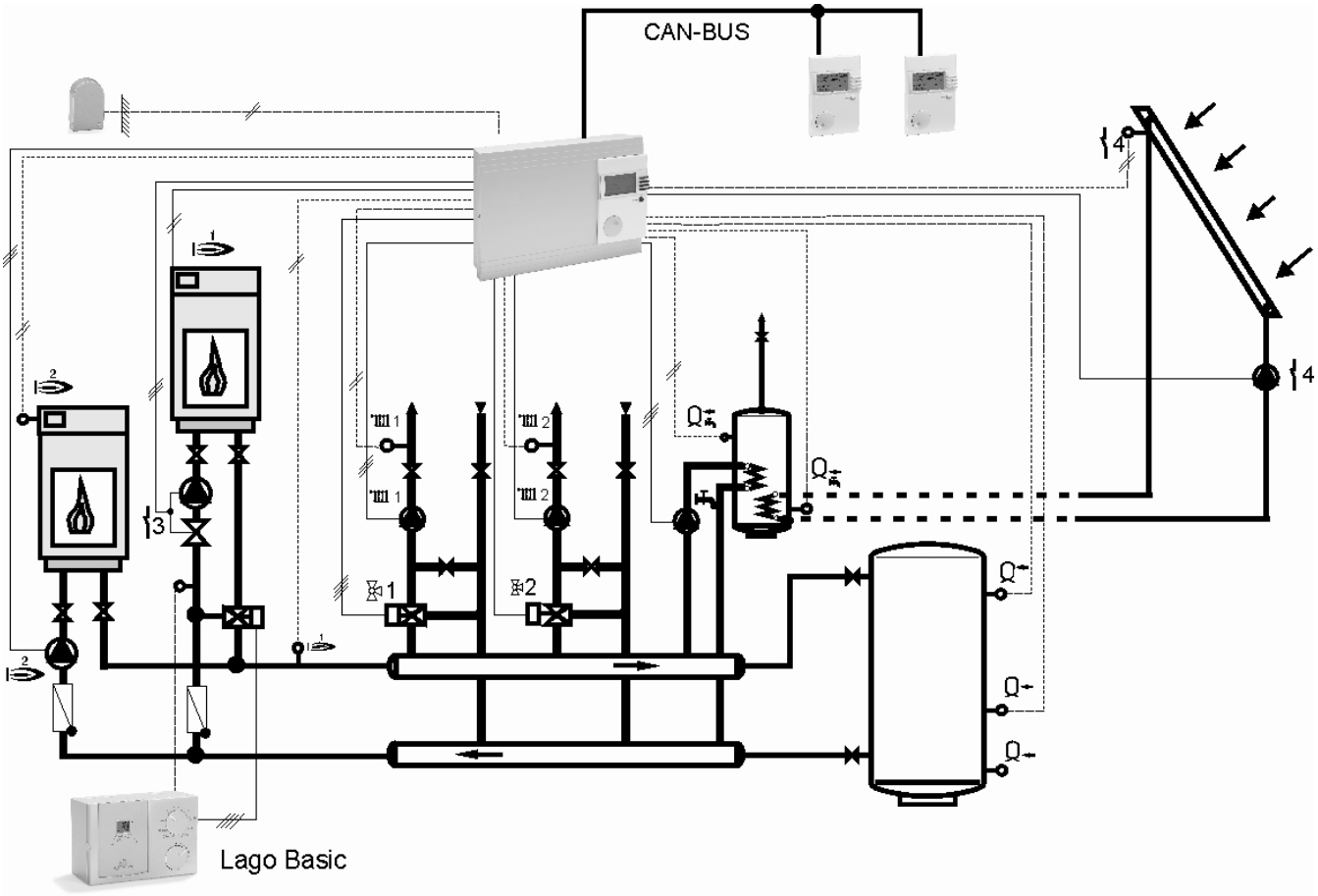
**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 26 | Storage charging pump |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 29+30 | HS1 |
| 32+33 | HS2 |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | Pump HS1 |
| 37 | Pump HS2 |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 06 = Merlin 6644 => Pellet and buffer controller**

***!*** For this installation it is necessary to program the solar function separately after selecting "06"!
The return flow temperature increase of the pellet boiler can be implemented using a Lago Basic unit or a heating circuit function.

- MF 4 Func = 23 (Solar)
- T-MF4 Setpoint = 60 (Max DHW-Storage for solar charge)
- MF4 Hyst = 5K Switch on difference




**Terminal assignment**

**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | Collector sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND | Buffer storage tank sensor, top |
| 6+GND | Buffer storage tank sensor, middle |
| 7+GND | Buffer storage tank sensor, lower |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Optional Hot-water tank bottom |
| 10+GND | Sensor Solid fuel boiler (HS2: PT1000) |
| 11+GND | Optional Sensor Solar collector(PT1000) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | Optional eBUS DCF |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

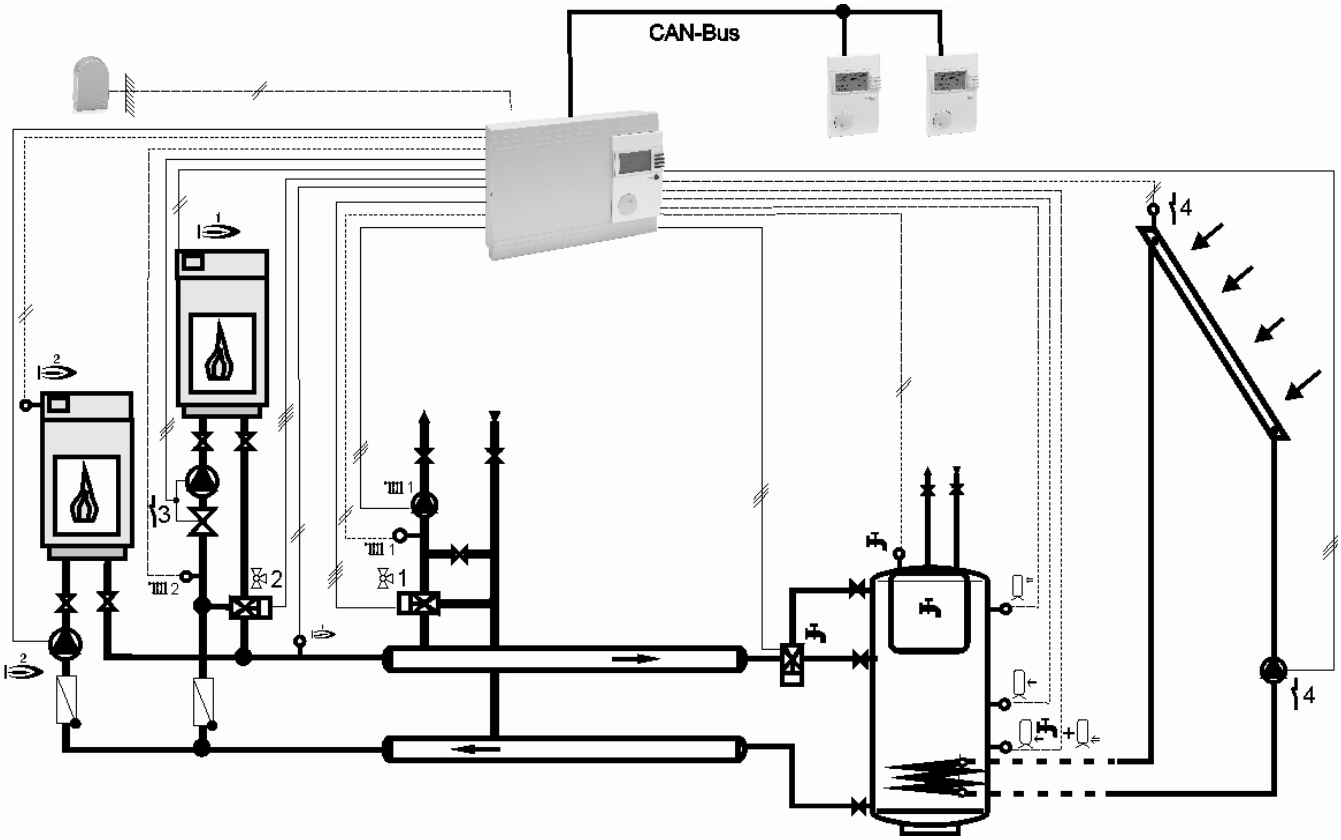
**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 26 | Storage charging pump |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 29+30 | HS1 (pellet boiler) |
| 32+33 | HS2 (solid fuel boiler) |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | HS1- pump |
| 37 | Optional Solar pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 06 = Merlin 6644 => Pellet and buffer controller with combination storage => with parameter settings!**

***!*** For this installation it is necessary to change the following parameters after selecting "06"! DHW-Load Through must not be activated!

- Buffer = 02 (combination storage)
- Heatcircuit 2: HC Function = Return flow (Heatcircuit 2 as return flow temperature increase via mixing valve)
- MF 4 Func = 23 (Solar)
- T-MF4 Setpoint = 60 (Max DHW-Storage for solar charge)
- MF4 Hyst = 5K Switch on difference




**Terminal assignment**

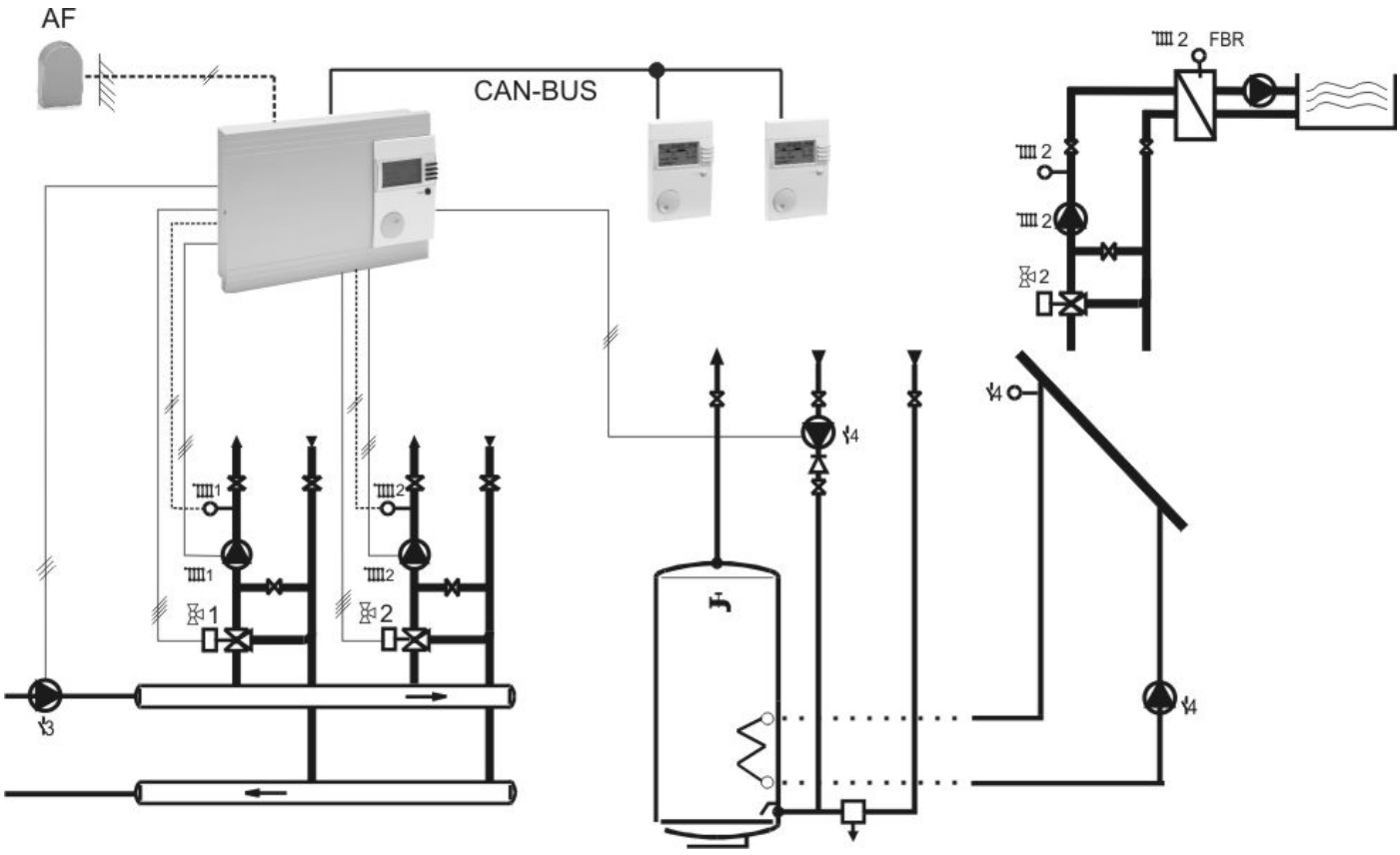
**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | Collector sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Return flow sensor Pellet boiler |
| 5+GND | Buffer storage tank sensor, top |
| 6+GND | Buffer storage tank sensor, middle |
| 7+GND | Buffer storage tank sensor, lower |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Hot-water tank bottom |
| 10+GND | Sensor Solid fuel boiler (HS2: PT1000) |
| 11+GND | Sensor Solar collector (PT1000) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | Optional eBUS DCF |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 26 | Storage charging pump |
| 27 | Mixer return flow temperature increase open |
| 28 | Mixer return flow temperature increase close |
| 29+30 | HS1 (pellet boiler) |
| 32+33 | HS2 (solid fuel boiler) |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | HS1- pump |
| 37 | Solar pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 07 = Merlin 1144 => Mixer valve extension**




**Terminal assignment**

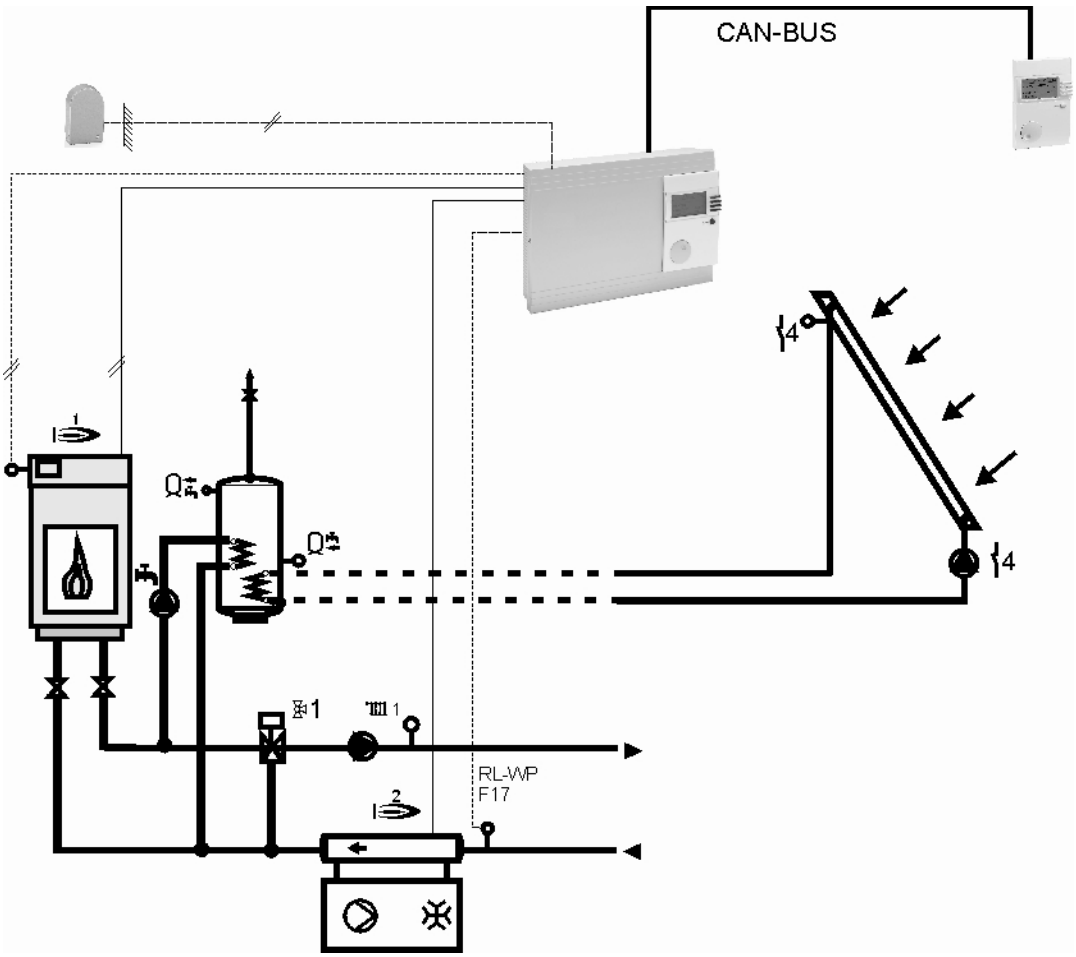
**Sensors**

| | |
|---|---|
| 1+GND | optional outdoor sensor |
| 2+GND | - - - - |
| 3+GND | - - - - |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND+6 | Optional FBR2 (FBR1) for Heatcircuit 1 |
| 6+GND | Optional room sensor for Heatcircuit 1 |
| 7+GND | - - - - |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Hot-water tank bottom |
| 10+GND | Sensor Solid fuel boiler (HS2: PT1000) |
| 11+GND | Optional multifunction relay sensor 4 (PT1000; but not in the case of circulation) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | - - - - |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 36 | Collector pump |
| 37 | Optional Solar pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

**Installation 09 = Cooling function in heating circuit return**




**Terminal assignment**

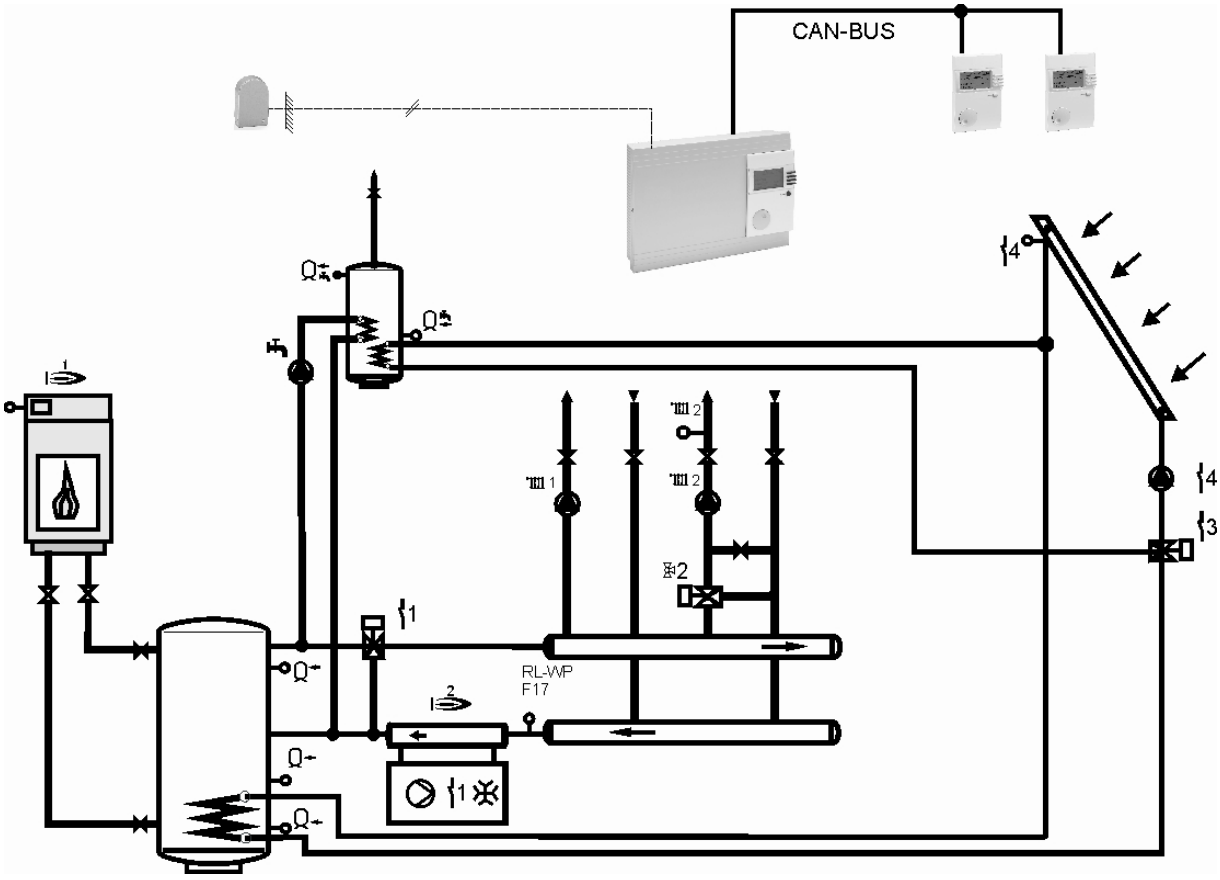
**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | HS1 sensor |
| 3+GND | Storage tank sensor |
| 4+GND | - - - - |
| 5+GND+6 | Optional FBR2 (FBR1) for Heatcircuit 1 |
| 6+GND | Optional room sensor for Heatcircuit 1 |
| 7+GND | - - - - |
| 8+GND | Flow sensor Heatcircuit 1 |
| 9+GND | Optional hot-water tank bottom |
| 10+GND | - - - - |
| 11+GND | Optional multifunction relay sensor 4 (PT1000; sensor solar collector) |
| 12+GND | - - - - |
| 13+GND | - - - - |
| 14+15 | Optional eBUS DCF |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | -- |
| 26 | Storage charging pump |
| 29+30 | HS1 / Burner 1 |
| 32+33 | Refrigerating machine |
| 34 | Mixing Valve, Heatcircuit 1 open |
| 35 | Mixing Valve, Heatcircuit 1 closed |
| 37 | optional Solar pump |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

## Installation 10 = Central cooling function and solar integration




### Terminal assignment

**Sensors**

| | |
|---|---|
| 1+GND | Outdoor sensor |
| 2+GND | HS1 sensor |
| 3+GND | Storage tank sensor |
| 4+GND | Flow sensor Heatcircuit 2 |
| 5+GND | Buffer storage tank sensor, top |
| 6+GND | Buffer storage tank sensor, middle |
| 7+GND | Buffer storage tank sensor, lower |
| 8+GND | -- |
| 9+GND | Hot-water tank bottom |
| 10+GND | - - - - |
| 11+GND | Sensor solar collector (PT1000) |
| 12+GND+13 | Optional FBR2 (FBR1) for Heatcircuit 2 |
| 13+GND | Optional room sensor for Heatcircuit 2 |
| 14+15 | Optional eBUS DCF |
| 16+17 | Data line CAN-BUS |
| 18+19 | Power supply CAN BUS |

**Mains**

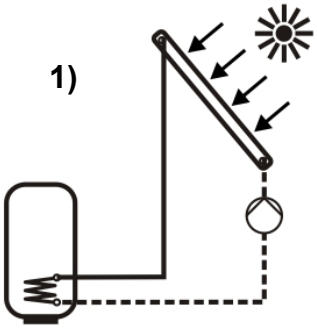
| | |
|---|---|
| 20 | N-conductor, mains |
| 21 | Power supply, unit |
| 24 | Pump, Heatcircuit 1 |
| 25 | Pump, Heatcircuit 2 |
| 26 | Storage charging pump |
| 27 | Mixing Valve, Heatcircuit 2 open |
| 28 | Mixing Valve, Heatcircuit 2 closed |
| 29+30 | HS1 |
| 32+33 | Refrigerating machine |
| 34 | Switching valve storage tanks 1 ➔ 2 |
| 35 | Bypass valve cooling mode |
| 36 | Switch-over valve storage tank 2 |
| 37 | Solar pump 1 |
| 38 | Power supply of relay via fuse (e.g. bridge to 22 = L1´) |

## *Solar installations - examples*

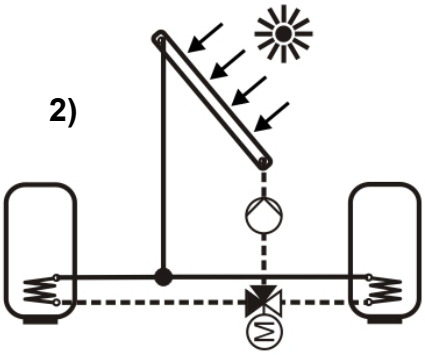
The MF relays 1-4 can be used to compile a wide variety of solar installations from individual functions.

If the MF relays 1+2 are to be used for solar functions, heatcircuit 1 can only be used as a direct heating circuit.

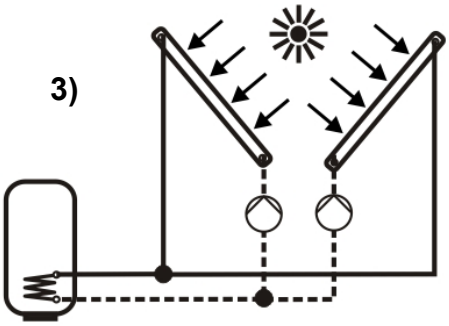
**1)**



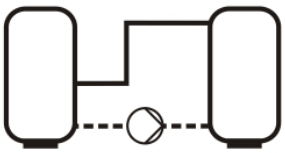
**2)**



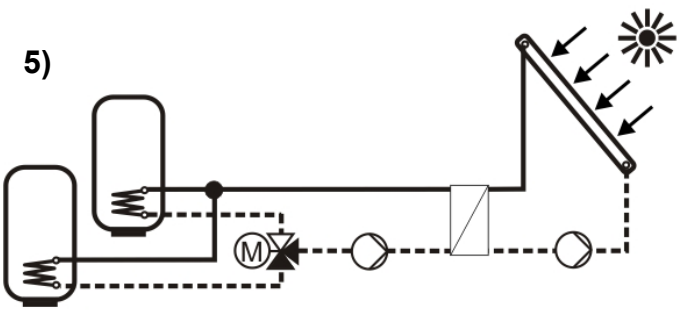

**3)**



**4)**



**5)**




**Code => Designation (sensor top, middle, bottom)**

DHW => Hot-water tank (F6, F12)
BU => Buffer storage for heating operation (F3, F2, F1)
Sp 3 => e.g. Pool (F15)
MF relay => Multifunction relay (F11, F12, F13, F14)

⚠ If only one collector field is controlled, the charging pump must be programmed to MF4. In the case of an East-West installation, the second collector pump must be programmed to MF3 (PT1000 sensor).

**1)** If only one storage tank is charged by the solar system, the MF4 relay must be programmed as a storage charging pump (27, 28, 29 depending on the type of storage / sensor). In this case, programming the collector pump is not conducive.

**2)** If two or all three storage tanks are charged by the solar system, the MF relays can be programmed as cylinder charging pump (27, 28, 29) provided a corresponding hydraulic system is also installed - all storage tanks are connected to the collector in parallel by means of charging pumps.

To comply with the hydraulic system shown, a collector pump (23) is programmed to MF4. Switching between the different storage tanks is done via the switch-over valves
07 => DHW to BU
08 => BU to Sp3
09 => DHW to Sp3 (if no BU is present)
The charging priorities are fixed and cannot be modified.

Prio 1 => Hot-water tank
Prio 2 => Buffer storage
Prio 3 => Pool or storage tank 3

**3)** In the case of an East-West installation (2 separate collector fields), collector pumps for the individual collector fields are programmed to MF4 and MF3. If there are multiple storage tanks, these are separated by switch-over valves (07, 08, 09) on MF1 or MF2.

**4)** In the case of cascade storage with transfer pumps, the pump can also be controlled by function 30 (DHW) or 31 (BU).

**5)** If one or more than one storage tanks are charged using a heat exchanger, the collector pump must be programmed to MF4 (23). The pump between heat exchanger and storage is programmed as a collector pump (23) to a different MF relay.

⚠ In the case of an East-West installation, the second collector must be integrated via MF3 (23) (PT 1000 sensor).

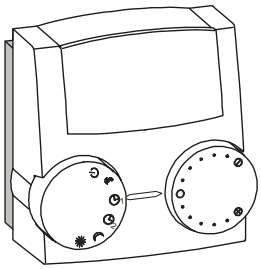
## *Accessories*

### The operating module Merlin BM, BM 8 and Lago FB

(Only for controller models with CAN-Bus connection)
Electrical connection: Connector [16+17+18+19]
The controller permits connection, via a bus line, of an operating module Merlin BM, BM8 and Lago FB for each heating circuit. The operating module allows various operation control functions and monitoring functions for the system values to be relocated to the main controlled zone – i.e. the living room.
This achieves maximum comfort and convenience.
A detailed description of the entire functional range is found in the technical descriptions of the operating modules.

- Display of the system parameters
- Entry of the heating circuit parameters
- Room temperature control
- Automatic adaption of the heat slope (not for Lago FB)

### Remote control FBR2



Connection for HC1: Connector [5+GND+6]
Connection for HC2: Connector [12+GND+13]

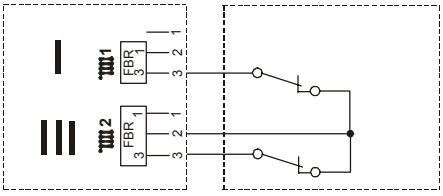
- Rotating potentiometer for modifying the room temperature setting
  Adjusting range: (±5 K)
- Room control via the integrated room sensor
- Rotating switch for selecting operating mode
  ⏻ Standby/OFF (frost protection only)
  $\oplus_1$ Automatic mode (acc. to timer program 1 in controller)
  $\oplus_2$ Automatic mode (acc. to timer program 2 in controller)
  ☽ 24-hour night operation (reduction temperature)
  ☼ 24-hour daytime operation (comfort temperature)
  Summer mode (heating OFF, hot water only)

Depending on the version, your FBR supports a portion of the following operating modes.

***!*** The operating mode at the controller must be set to ⊕.

The controller can also be operated with an FBR1.

### Telephone switch




The heating system can be switched to Heating mode ☼ with a telephone switch. The connection terminals of the controller for the remote control FBR (see connection diagram) are used for installation. As soon as a short circuit is detected between terminal ([6+GND at Hc1] and [13+GND at HC2], the associated heating circuit switches to heating circuit. Additionally the hot water preparation is activated (only for controllers with hot water preparation). When the short circuit is eliminated, the controller once again heats on the basis of the set heating program.

⚠ If the heating circuit is controlled remotely by an operating module, the telephone switch must be connected at the operating module.

### DCF receiver

Electrical connection: Terminal [14, 15]
The controller can evaluate an eBUS DCF receiver on the eBUS FA-Terminals.

If the DCF receiver is connected, the controller time is updated as soon as the DCF transmits a valid time on the BUS.

If the time has not been corrected after max. 10 min, select a different place of installation for the DCF (e.g. another wall - not in proximity to TV devices, monitors or dimmers).

### PC

All system-specific parameters can be set and interrogated using the C*omfort*S*oft* parameterisation software. The parameters can be saved, displayed graphically and evaluated on the PC at predefined intervals. To connect to a PC, you need the CoCo PC active, which also supports the sending of error messages by SMS and the remote interrogation of controller data.

### System bus

This controller can be expanded in a modular fashion using additional modules that are connected via the integrated bus. In its maximum configuration, the system can be used to control the following heating system components

1-8 Boiler (modulating or switching)

1-15 Mixed weather-dependent heating circuits

0-15 Room controller (digital or analogue)

1 Solar system (2 collectors, 2 storage tanks)

1 Solid fuel boiler

The various components are simply coupled to the system bus. The modules log on to the system automatically and search for their communication partners via the defined bus IDs (heating circuit number or boiler number).

### Bus ID

For mixer motor controllers and control units

The bus ID (00-15; expert level parameter) is used to number the heating circuits in the system. Each operating module and each mixer motor module is given the number of the assigned heating circuit as its bus ID.

- Heating circuit numbers (00-15) may not be assigned twice.
- Heating circuit numbers 00 and 01 may not be used simultaneously.
- The heating circuits are sequentially numbered starting with "01".
- Please only use heating circuit number 00 for replacement controllers if "00" was used in the replaced controller.

Pre-settings

Heatcircuit 1 ➔ 01
Heatcircuit 2 ➔ 02

***!*** After setting all the bus ID's the system must be reenergised (once only).

## *Sensors*

### Sensor values / characteristic curve

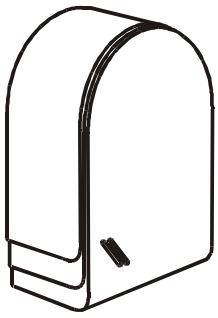
| Temperature | 5Kohm NTC | 1Kohm PTC | PT1000 |
|---|---|---|---|
| -60°C | 698961 Ω | 470 Ω | |
| -50°C | 333908 Ω | 520 Ω | |
| -40°C | 167835 Ω | 573 Ω | |
| -30°C | 88340 Ω | 630 Ω | |
| -20°C | 48487 Ω | 690 Ω | 922 Ω |
| -10°C | 27648 Ω | 755 Ω | 961 Ω |
| 0°C | 16325 Ω | 823 Ω | 1.000 Ω |
| 10°C | 9952 Ω | 895 Ω | 1.039 Ω |
| 20°C | 6247 Ω | 971 Ω | 1.078 Ω |
| 25°C | 5000 Ω | 1010 Ω | |
| 30°C | 4028 Ω | 1050 Ω | 1.118 Ω |
| 40°C | 2662 Ω | 1134 Ω | 1.155 Ω |
| 50°C | 1801 Ω | 1221 Ω | 1.194 Ω |
| 60°C | 1244 Ω | 1312 Ω | 1.232 Ω |
| 70°C | 876 Ω | 1406 Ω | 1.270 Ω |
| 80°C | 628 Ω | 1505 Ω | 1.309 Ω |
| 90°C | 458 Ω | 1607 Ω | 1.347 Ω |
| 100°C | 339 Ω | 1713 Ω | 1.385 Ω |
| 110°C | 255 Ω | 1823 Ω | 1.422 Ω |
| 120°C | 194 Ω | 1936 Ω | 1.460 Ω |

As-delivered condition = 5KOhm NTC sensor.

The start-up level for setting the installed sensors appears once after switching on the power supply and switching into operating mode. It can be reactivated again by briefly switching the supply voltage off.

Exceptions:

- The sensor inputs F13 + F14 must always be operated using a PT1000 sensor.
- Connecting an analogue remote control FBR is detected automatically. Thus, the previous and the new version can be connected to the controller.
- The controller provides the option of performing a room temperature guided control through the connection of a room sensor to the FBR terminals 1 and 2. In this case, only a 5KOhm NTC sensor can be used.



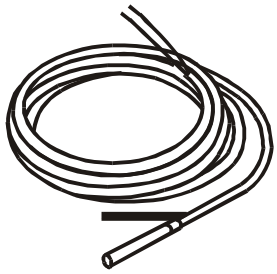
## Outdoor sensor AF

**Installation location:**

- Wherever possible, on a northerly or north-easterly wall behind a heated room
- Approx. 2.5 m above ground
- Not above windows or ventilation shafts

**Installation:**

- Detach the cover.
- Attach the sensor with the supplied screw.



## Immersion sensor KF / SPF

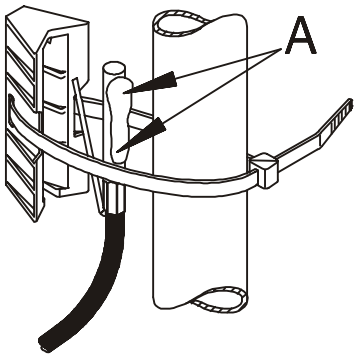
**Installation location:**

- Immersion sleeve for thermometer, temperature controller and boiler sensor in heating boiler
- In the immersed pipe of the hot-water cylinder tank (generally on the front face of the tank)

**Installation:**

- Slide the sensor as far as possible into the immersed pipe.

***!*** The immersed sleeve must be dry.




## Flow sensor VF

**Installation location:**

- In the case of boiler control instead of the boiler sensor KF as close as possible behind the boiler on the heating flow pipe
- In the case of mixer operation approx. 0.5 m behind the circulation pump

**Installation:**

- Thoroughly clean the flow pipe.
- Apply heat conductive paste (A)!!
- Secure sensor with stretch band.

## *Commissioning*

### Process

1. Please read this guide carefully before commissioning
2. Mount the controller, connect it to the electrical system and switch on the power supply.
3. Wait until "Installation" appears on the display.
4. [End] End installation (standard values) or
5. [OK] Start installation
6. ◌1. Set value or use
7. [Standard] to load the standard value
8. [OK] Save value and next value ...
9. The installation must be completely finished => standard display
10. Press the ○ *Home* button to switch between normal and operating mode
11. Press the F button [4] program switch and use ◌ to adjust the operating mode e.g. Automatic 1 (see page 7)

### Setup

All the values in this level must be entered in sequence without interruption

| | |
|---|---|
| Language | Set language |
| Time | Set the hour and minute |
| Date | Set the year, month, day |

| Designation | Value range | Standard | IV |
|---|---|---|---|
| Plant select | ----, 01 - 10 | ---- | |
| HS1 Type | 00 – 06 | 03 | |
| HS1 BUS | 00 – 05 | 00 | |
| HS2 Type | 00 – 22 | 00 | |
| Storage HS2 | 00 - 03 | 00 | |
| Buffer | 00, 01, 02 | 00 | |
| Cool Operation | OFF/ON | OFF | |
| Gradient | On/Off | Off | |
| HC Function HC1 | Standard, T-Circuit Fxd, Pool, HW, Return | Standard | |
| HC Function HC2 | See HC1 | Standard | |
| Capacity / Stage | 00 – 9950 kW | 00 kW | |
| BUS Scan | On/Off | Off | |
| See following pages for continuation | | | |

### Basic settings

**English**

Select the language

**Time**

Enter the current time.

**Year/Month/Day**

Enter the current date

### Configuration

**Plant select (selecting basic controller functions)**

This set value can be used to preset the other values of the start-up level
(see also installation description on page 40).

When the installation set value is selected, this also displays "----" = no change to preset => values retain their previously defined status
(values on delivery: Merlin 0634 2-stage burner; hot water preparation two mixed heating circuits).

01 = [4034] => cascade controller for modulating boiler
02 = [4834] => cascade controller for switching boiler
03 = [3611] => 0-10V controller
04 = [0634] => Standard controller with 2-stage HS
05 = 2HS controller => 2 HS cascade switched via relay
06 = [6644] => buffer and pellet controller with solar function
07 = [1144] => Mixer valve extension
09 = [0321] => Cooling function in heating circuit return
10 = [0321] => Central cooling function and solar integration

**HS1 Type** (first heat generator type)

00 = No heat generator
01 = Single stage HS switching
02 = Single stage modulating
03 = 2-stage HS switching (second stage via A7)
04 = Two individual HS switching (second HS via A7)
05 = Multi-stage switching (cascade via BUS)
06 = Multi-stage modulating (cascade via BUS)

**HS1 BUS** (connection for HS)

00 = Relay => Standard (switching HS)
01 = CAN-BUS => Standard (cascade switching)
02 = eBUS => HS without temperature controller
=> Preset modulation depth
=> Standard (cascade modulating)
03 = eBUS => HS with temperature controller
=> Preset desired temperature
[not suitable for cascade]
04 = 0-10V Presetting of the desired temperature [T-HS DES]
only for HS1 Type = 01, 02 or 03
Burner relays are controlled in parallel
Sensor KF [F8] must be connected

05 = 0-10V Preset modulation depth only for HS1 Type = 02

**HS2 Type** (second heat generator type => A7)

(For HS1 with 2-stage burner – not active)

00 = No secondary heat generator
01 = Single stage HS switching
08 = Cooling 1
20 = Solid fuel integration
(additional non-controllable HS)
for switching behaviour, see parameter HS2 storage
21 = Collector pump
22 = Pump for HS1 (e.g. additional HS for cascades)

**Storage HS2** (heat accumulator for HS2)

(Only where HS2 Type = Solid fuel)

Warm-up relief applies superordinated:
ON: T-HS2 > Min T-HS2
OFF: T-HS2 < [Min T-HS2 – 5K]
T-HS2 = Solid fuel burner temperature

00 = Heating vis-à-vis collector (no storage tank) => F8
ON: T-HS2 > [F8 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F8 + Hyst Burner 2]

01 = Heating vis-à-vis buffer storage tank => F1, F3
ON: T-HS2 > [F3 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F1 + Hyst Burner 2]

02 = Heating vis-à-vis HW tank => F6
ON: T-HS2 > [F6 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F6 + Hyst Burner 2]

03 = Heating vis-à-vis STORAGE III (Pool) => F15
ON: T-HS2 > [F15 + Hyst Burner 2 + 5K]
OFF: T-HS2 < [F15 + Hyst Burner 2]

Switching pattern

The pump is switched on if the temperature of the solid fuel boiler exceeds the temperature of the Reference sensor by the hysteresis (Hyst Burner 2 + 5K). Switching off occurs when the temperature drops 5K below the switch-on temperature.

Warm up Temp

Switching off occurs when the temperature of the solid fuel boiler drops below the set limit temperature (Min T-HS2) by 5K. The pump is enabled again when the temperature of the solid fuel boiler exceeds the set limit temperature (Min T-HS2).

**Buffer** (heater buffer storage type)

***!*** After activation (01 or 02) it is not possible to connect a FBR for heatcircuit 1.

00 = no buffer storage for heating operation

01 = Buffer storage for heating operation (F2, F3)

HS1 is activated with reference to sensor "buffer top" (F3)

DHW Relief operates on sensor "upper buffer".

HW charge pump ON:
"Upper buffer" > HWactual + 5K Hysteresis
HW charge pump OFF:
"Upper buffer" < HWactual

02 = Combination storage tank for heating and HW operation

HS1 is activated with reference to sensor "buffer middle" (F2)

DHW Relief operates on boiler sensor KF.

HW charge pump ON:
KF > HWactual + 5K Hysteresis
HW charge pump OFF:
KF < HWactual

03 = passive buffer storage for heating operation (F1, F3)

The buffer will not load by the conventional Heat generator producers. The use occurs, e.g., through solar buffer loading [Buffer charging pump], [return flow temperature increase] or [transfer pump for buffer storage] (sensor usable).

In this attitude no change of the regulation of the heating takes place in relation to the without buffers

**Cooling mode (Space cooling via operating mode)**

The mode of operation cooling and the necessary settings are released. In the mode of operation cooling the heating circles can be used for the cooling of the room. For this function a refrigerating machine is necessary.

**Gradient**

ON = HS1 Switching off for Gradient method
OFF = HS1 Switching off by set value + Hysteresis

See also under
„Switching behaviour of the HS with gradient method“

**HC FUNCTION** (heating circuit function selection)

Standard => Standard heating circuit

T-Circuit Fxd => Control for fixed flow temperatures
During the heating periods (see heating program ) the heating circuit is operated with a fixed preset flow temperature
[T-Flow Day], and during reduced mode operation with a fixed preset flow temperature [T-Flow Night] accordingly.

Pool => Pool control (only Heatcircuit 2)
This function can be used to heat a swimming pool. The mixer controls the flow temperature for the swimming pool heat exchanger. The sensor for the water temperature of the pool is connected to the room sensor connection for the heating circuit (see FBR) [connector 5+GND or 12+GND].

The flow temperature control operates like normal room control [Room Influence].
The set value for the water temperature can be entered in the user area of the associated heating circuit level [T-Pool 1/2/3]. The heating program operates. No heating takes place during the reduction period (frost protection only).
The water temperature and the current set value are displayed in the display level [T-Pool / T-Pool Desired].

HW => Hot water circuit

This function can be used to operate additional hot water circuits. The heating circuit flow sensor is located in the hot water storage tank.
The hot water temperature set value can be entered in the user area of the associated heating circuit level [T-DHW 1/2/3]. The heating program for the heating circuit acts as an enable program for the storage tank. The storage tank set value is set to 10°C during the reduction period.
The boiler controller hot water priority function can be used (partial priority acts like priority).

Return flow => Return flow temperature increase via mixer motor
(only for heating circuit II)
The heating circuit flow sensor is used as a boiler return flow sensor. The mixer motor controls to the heating circuit set value for 24 hours [Min T-Flow].

**Installation tip:** Mixer Open => boiler flow is fed into the return (=> return flow temperature increase)
Mixer Closed => heating circuit return is passed through.
When the mixer motor is open it must be ensured that there is circulation through the boiler (boiler pump).

**Capacity / Stage (HS output for each stage)**

(Only for cascades)

Display of the HS number and the stage => Selection with Prog button => Input/Adjustment of HS output

- - - - = Stage / HS not available

0 = Stage / HS available and deactivated

In the case of boilers with the same output, a boiler release is sufficient; e.g.:

HS1 01 => 01
HS1 02 => 01
HS2 01 => 01 etc.
(depends on the number of heat generators)

Automatic assignment:

After restarting or after a new configuration, the controller searches the bus systems for a heat generator. Within this time period (approx. 1 min) no manual output entries are allowed [Display "SCAN"]. In the case that a heat generator answers with output information, this output is automatically entered into the list. In the case that a heat generator answers without output information, 15kW is entered into the list. This value can then be adjusted manually.

| Designation | Value range | Standard | IV |
|---|---|---|---|
| MF (1-4) Func | 00 - 34 | 00,00,01,02 | |
| T-MF(1-4) Setpoint | 30°C - 90°C | 30°C | |
| MF(1-4) Hyst | 2K – 10K | 5 K | |
| MF(1-4) Hyst Off | 2K – 10K | 2 K | |
| F15 Function | 00 - 05 | 00 | |
| BUS ID HC1 | 00 - 15 | 01 | |
| BUS ID HC2 | 00 - 15 | 02 | |
| 5K SENSORS | 5K, 1K | 5 K | |

## Auxiliary relay functions

The multifunction relays = MF relay is assigned one basic function respectively

MF-1: Mixing Valve HC1 OPEN (MF 1 Func = 00)
MF-2: Mixing Valve HC1 CLOSED (MF 2 Func = 00)
MF-3: Collector pump (MF 3 Func = 01)
MF-4: Circulation (time) (MF 4 Func = 02)

If this basic function of a MF relay is not required (configuration of the installation in Installation level), any one of the functions described below may be selected for any unused relay.

The MF-relay 1-4 (A8-A12) is always assigned with a sensor 1-4 (F11-F14) (applies for functions starting from "20" only). If a further sensor is required for a function, this sensor must be connected as F17 (connector III, Pin 2+3).

**Must be observed!**

! Operation as 1144: Selectable MF functions => 02,15,16,24,25,33,39

! Operation as 1144: The circulation pump is not started automatically during the Hot water short time heating function.

! If an MF solar function (07, 08, 09, 23, 27, 28, 29) is activated, no further external solar controller may be connected.

The functions that may be selected for the MF relays 1-4 are described using MF relay 1 as an example.

**MF 1 Func** (function selection relay MF1)

**T-MF1 Setpoint** (switching temperature relay MF1)

**MF 1 Hyst** (hysteresis relay MF1)

**00 = No MF function**

**01 = Collector pump**
ON: When heat is requested by a consumer
OFF: Without consumer heat request
If at least one consumer in the system requests heat the pump is switched on. The after-run function runs after the burner has been switched on.

**02 = Circulation (time)**
Switching the relay according to the time program for the circulation pump

**03 = Booster pump**
ON: When heat is requested by an internal consumer
OFF: When no heat is requested by an internal consumer. Follow-up pump action occurs.

**05 = Pump HS1**
The relay may be used to control boiler pump for heat generator 1.
(Relay switches with burner relay 1; run-down =5 min)

**06 = Pump HS2**
The relay may be used to control boiler pump for heat generator 2.
(Relay switches with burner relay 2; run-down =5 min)

**07 = Switch-over valve Storage 2 (buffer)**
The valve changes solar production over from hot-water tank to buffer storage if it is not possible for any more collectors to feed the hot-water tank.

**08 = Switch-over valve Storage 3 (swimming pool)**

! The F15 function must stand on 5.

The valve changes solar production over from buffer storage to storage tank 3 [F15] if it is not possible for any more collectors to feed the buffer storage.

**09 = Switch-over valve Storage 3 (swimming pool)**

! The F15 function must stand on 5.

(only for systems without solar buffer charging)
The valve switches the solar production from the hot-water tank to Storage 3 [F15] as soon as no collector is able to charge into the hot-water tank.

**12 = Remote-controlled output Heatcircuit 1**
The relay can be switched from the control unit of the heating circuit via the BUS (for function, refer to control unit manual).

**13 = Remote-controlled output Heatcircuit 2**
The relay can be switched from the control unit of the heating circuit via the BUS (for function, refer to control unit manual).

**14 = Not used**
**15 = Not used**
**16 = Not used**
**17 = Not used**
**18 = Not used**
**19 = Not used**

**20 = Temperature-controlled circulation pump**
T-CIRCL = Return flow temperature of circulation line
ON: T-CIRCL < T-MF1 SETPOINT
OFF: T-CIRCL > [T-MF1 SETPOINT + MF 1 HYST]

The circulation pump is switched on when the return flow temperature drops below the temperature setting limit (T-MF1 SETPOINT).
The pump is switched off again when the return flow temperature exceeds the set limit temperature by the Hysteresis (MF 1 HYST).
The set circulation program and the "Circulation with hot water" setting have an overriding function
=> Switching on only takes place during enable periods.

**21 = Pulsed circulation pump**
ON: With short circuit at assigned sensor input
OFF: After 5 minutes
If a short-cut occurs at the multifunction sensor input the circulation pump is switched on for 5 minutes. Switching on takes place on the edge (once only).
The set circulation program and the "Circulation with hot water" setting have an overriding function
=> Switching on only takes place during enable periods.

**22 = Solid fuel boiler integration**
(e.g. in connection with 2-stage HS)
T-MF1 or 1-4 = Temperature of the solid fuel boiler
T-BUFFER B = Temperature of buffer storage in the infeed area [F1]
ON: T-MF1 > [T-BUFFER B (F1) +MF 1 HYST + 5K]
OFF: T-MF1 < [T-BUFFER B (F1) + MF 1 HYST]

Warm Up Temp:
ON: T-MF1 > T-MF1 SETPOINT
OFF: T-MF1 < [T-MF1 SETPOINT – 5K]

The pump is switched on when the temperature of the solid fuel boiler exceeds the temperature of the buffer storage in the infeed area [T-BUFFER B (F1)] by the hysteresis [MF 1 HYST+ 5K]. Switching off occurs when the temperature drops 5K below the switch-on temperature.

Switching off also occurs when the temperature of the solid fuel boiler drops below the set limit temperature [T-MF1 SETPOINT] by 5K. The pump is enabled again when the temperature of the solid fuel boiler exceeds the set limit temperature [T-MF1 SETPOINT].
Blocking HS1:
ON: T-MF1 > HS set temperature + 5K and solid-fuel boiler pump = ON
OFF: T-MF1 <= HS set temperature or solid-fuel boiler pump = OFF

**23 = Collector pump**
**(pump is operational as soon as the collector is able to charge one of the solar storage tanks)**

***!*** Collector 1 pump only at MF4 because of sensor assignment and PT 1000

***!*** Collector 2 pump only at MF3 because of sensor assignment and PT 1000

***!*** At MF1 and MF2, this function can be used to charge the storage tank from a heat exchanger (without PT 1000 sensor)

T-COLLECTOR = Temperature of the solar collector
T-L = Temperature of active storage tank at inlet area
ON: T-COLLECTOR>
[T-B + MF HYST]
OFF: T-COLLECTOR<
[T- B + MF HYST OFF]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the active storage tank (see switch-over valves) in the infeed area by the switch on hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-B + MF HYST OFF].

A check is conducted before switch-off as to whether a secondary storage tank (see switch-over valves) can be fed.

Safety / system protection:
OFF: T-T > T-MF SETPOINT
ON: T-T < [T-MF SETPOINT – 5K]

Switching-off occurs when the temperature of the active storage tank at the upper area of the inlet exceeds the set limit temperature (T-MF SETPOINT). The pump is enabled again when the storage tank temperature drops below the limit temperature by 5K.

**24 = Return flow temperature increase HS1**
T-RETURN 1 = Return flow temperature from the installation [= T-MF1 or 1-4].
ON: T-RETURN 1 < T-MF1 SETPOINT
OFF: T-RETURN 1 > [T-MF1 SETPOINT +MF 1 HYST]

The return flow temperature increase pump is switched on if the return flow temperature drops below the temperature setting limit (T-MF1 SETPOINT). It is switched off again when the return flow temperature exceeds the temperature setting limit by the Hysteresis (MF 1 HYST).

**25 = Return flow temperature increase HS2**
T-RETURN 2 = Return temperature of system
ON: T-RETURN 2 < T-MF1 SETPOINT
OFF: T-RETURN 2 > [T-MF1 SETPOINT +MF 1 HYST]

The return flow temperature increase pump is switched on if the return flow temperature drops below the temperature setting limit (T-MF1 SETPOINT). It is switched off again when the return flow temperature exceeds the temperature setting limit by the Hysteresis (MF 1 HYST).

**26 = Return flow temperature increase HS via buffer storage**
ON: T-BUFFER B [F1] > T-MF1 +MF 1 HYST + 5K
OFF: T-BUFFER B < T-MF1+MF 1 HYST

The valve to the return flow temperature increase via the buffer storage is opened if the temperature buffer storage low [T-BUFFER B] exceeds the return flow temperature of the installation [sensor 1 or 1-4] by the Hysteresis (MF 1 HYST + 5K). It is switched off again when the temperature buffer storage low drops below the return flow temperature.

**27 = Storage charging pump 1**
**(pump operates when the hot-water tank can be charged by the solar system)**

***!*** The temperature of the medium used for charging the storage tank is always measured at the MF4 sensor [T-MF4]. Exception: In the case of function [23] at MF4, the sensor assigned to the MF relay storage charging pump 1 is used to determine the temperature of the medium used for charging the storage tank [T-SOLAR].

T-SOLAR [T-MF4] = Temperature of the solar collector
T-SOLAR [T-MF 1-3] = Temperature of the heat exchanger
T-DHW B [F12]= Temperature of hot water storage tank in infeed area

ON: T-SOLAR >
[T-DHW B + MF HYST]
OFF: T-SOLAR <
[T-DHW B + MF HYST OFF]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the storage tank in the infeed area (T-DHW B) by the Hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-DHW B + MF HYST OFF].
Safety / system protection:
OFF: T-DHW > T-MF SETPOINT
ON: T-DHW < [T-MF SETPOINT – 5K]

Switching off occurs when the storage tank temperature exceeds the set limit temperature (T-MF SETPOINT). The pump is enabled again when the storage tank temperature drops below the limit temperature by 5K.

**28 = Storage charging pump 2**
**(pump operates when the buffer storage tank can be charged by the solar system and the hot-water tank can not be charged by the solar system)**

***!*** The F15 function must stand on 5.

***!*** The temperature of the medium used for charging the storage tank is always measured at the MF4 sensor [T-MF4]. Exception: In the case of function [23] at MF4, the sensor assigned to the MF relay storage charging pump 2 is used to determine the temperature of the medium used for charging the storage tank [T-SOLAR].

T-SOLAR [T-MF4] = Temperature of the solar collector
T-SOLAR [T-MF 1-3] = Temperature of the heat exchanger
T-Buffer B [F1] = Temperature of buffer storage in the infeed area
ON: T-SOLAR >
[T-Buffer B + MF HYST]
OFF: T-SOLAR <
[T-Buffer B + MF HYST OFF]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the storage tank in the infeed area (T-Buffer B) by the Hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-Buffer B + MF HYST OFF].

Safety / system protection:
OFF: T-Buffer T > T-MF SETPOINT
ON: T-Buffer T < [T-MF SETPOINT – 5K]

Switching off occurs when the storage tank temperature exceeds the set limit temperature (T-MF SETPOINT). The pump is enabled again when the storage tank temperature drops below the limit temperature by 5K.

**29 = Storage charging pump 3**
**(pump operates when the storage tank 3 can be charged by the solar system and the buffer storage tank can not be charged by the solar system)**

***!*** The temperature of the medium used for charging the storage tank is always measured at the MF4 sensor [T-MF4]. Exception: In the case of function [23] at MF4, the sensor assigned to the MF relay storage charging pump 3 is used to determine the temperature of the medium used for charging the storage tank [T-SOLAR].

T-SOLAR [T-MF4] = Temperature of the solar collector
T-SOLAR [T-MF 1-3] = Temperature of the heat exchanger
T-Storage 3 [F15]= temperature of storage tank 3 in the infeed area
ON: T-SOLAR<
[T-Storage 3 + MF HYST]
OFF: T-SOLAR <
[T-Storage 3 + MF HYST]

The pump is switched on when the temperature of the solar collector exceeds the temperature of the storage tank in the infeed area (T-Storage 3) by the Hysteresis (MF HYST). Switching off occurs when the temperature drops below the temperature [T-Storage 3 + MF HYST OFF].

Safety / system protection:
OFF: T-Storage 3 > T-MF SETPOINT
ON: T-Storage 3 < [T-MF SETPOINT – 5K]

Switching off occurs when the storage tank temperature exceeds the set limit temperature (T-MF SETPOINT). The pump is enabled again when the storage tank temperature drops below the limit temperature by 5K.

**30 = transfer pump DHW storage tank II**

***!*** The F15 function must stand on 4.

Relay switches when the temperature of the hot-water storage tank exceeds the temperature F15 by the hysteresis (MF HYST ). Switching off occurs when the temperature drops below the temperature [F15 + MF HYST OFF].

**31 = transfer pump buffer storage tank II**

***!*** The F15 function must stand on 4.

Relay switches when the temperature of the buffer storage tank exceeds the temperature F15 by the hysteresis (MF HYST ). Switching off occurs when the temperature drops below the temperature [F15 + MF HYST OFF].

**32 = Direct heating circuit**
Heating circuit with fixed flow temperature => T-MF Des
In the event of a short circuit at the assigned MF sensor (via room thermostat/timer switch)
=> Heating circuit pump ON
=> Preset desired flow temperature to the HS
After the sensor short circuit has been eliminated, a run-on time takes effect on the pump.

**33 = Thermostat function**
ON: T-MF > T-MF DES
OFF: T-DHW < [T-MF DES – 5K]

**34 = bypass valve cooling mode**
The relay is switched in cooling mode
=> separation of the conventional HS from the cooling circuit.
=> This means hot water preparation during cooling operation is possible (the flow temperature for the HS control is captured by the MF sensor)

**Max T-Solar**

The collector pumps are disabled when the associated collector temperature exceeds the safety threshold set here -> System protection. The pumps are reactivated when the temperature falls below the temperature [maximum collector temperature – 10K].

**Min T-Solar ON**

The collector pump is enabled when the associated collector temperature exceeds the temperature [Min T-Solar ON].

**Min T-Solar OFF**

The collector pump is disabled when the associated collector temperature drops below the temperature [Min T-Solar OFF]. This function prevents pump operation without relevant heat production.

**T-Solar protect**

The collector protection temperature protects the collector against overheating. If the collector temperature exceeds the set collector protection temperature and the storage tank temperature is less than 92°C, then the storage tank is fed beyond its maximum temperature to 95°C to cool the collector. The function is interrupted when the collector exceeds its maximum temperature. The function is activated again when the collector temperature drops below the maximum temperature-3K.

**Rflow cool diff**

Parameter = 0 => No storage tank recooling

If the collector protection function has fed the storage tanks during the day to temperatures in excess of the set maximum storage tank temperatures, then the storage tank can automatically be cooled at night between 1.00 and 6.00 hours by activating this function by switching on the feeding pumps to the set maximum temperature of the storage tank. The storage tank cannot be fed during this period. Recooling can take place only when the temperature of the storage tank exceeds the collector temperature at least by the value of return flow cooling difference +3K hysteresis.

**Max T-Storage DHW, BU, 3**

If a top of tank sensor is installed, it is used to monitor the maximum temperature at this sensor. If this sensor is not installed, the maximum storage tank temperature is monitored at bottom storage tank sensor. In this case, the layering of the tank must be taken into account. The feeding pumps are disabled when the temperature of the storage heater exceed the safety limit temperature set here.

System protection: The pumps are reactivated when the temperature falls below the temperature [maximum storage temperature – 5K].

**Sol Kick Period [sec]**

Collector pump runtime following pump kick.

**Sol Kick Pause [min]**

If the collector pump has not run for the duration set here, the pump is activated for the kick duration period.

**Sol Kick Gradient [min]**

The course of the collector temperature is controlled during this period following a pump kick. If an increase of 0.5K is detected, the pump is started for a further minute.

**F15 function (sensor function for F15)**

00 = Room sensor for Heatcircuit 2. if a further sensor at the pulse input [IMP = F17] is detected at this position, an FBR is evaluated at F15 and F17. If F17 is used by a different function, an RFB is evaluated at F15.

01 = 0-10V input for presetting an external collector set temperature. On evaluation see Parameter [V-Curve] in the Expert/Installation level.

02 = Light sensor => without function

03 = 0..10V input for presetting an external modulation depth. On evaluation see Parameter [V-Curve] in the Expert/Installation level.

04 = secondary sensor for MF function

05 = storage tank 3 (e.g. pool)

**Bus ID (heating circuit number):**

The heating circuits are sequentially numbered starting with "01". heating circuit numbers must not be assigned twice. Please only use "00" for replacement controllers (see page 52).

**Sensors**

Selection of the installed sensors

5k Sensors (5kOhm NTC sensors)
1k Sensors (1kOhm PTC sensors)
Code-No. required

## *Error Messages*

| Error | Error description |
|---|---|
| Communication error | |
| E 90 | Adr. 0 and 1 on bus. Bus IDs 0 and 1 may not be used simultaneously. |
| E 91 | Bus ID used. The set bus ID is already in use by another device. |
| E 200 | Communication error HS1 |
| E 201 | Communication error HS2 |
| E 202 | Communication error HS3 |
| E 203 | Communication error HS4 |
| E 204 | Communication error HS5 |
| E 205 | Communication error HS6 |
| E 206 | Communication error HS7 |
| E 207 | Communication error HS8 |
| Internal error | |
| E 81 | EEPROM error. The invalid value has been replaced with the default value<br>⚠ Check parameter values! |
| Sensor defective (break/short circuit) | |
| E 69 | F5: Flow sensor HC2 |
| E 70 | F11: Flow sensor HC1, sensor Multifunction1 |
| E 71 | F1: Buffer storage tank bottom sensor |
| E 72 | F3: Buffer storage tank top sensor |
| E 75 | F9: Outdoor sensor |
| E 76 | F6: Storage tank sensor |
| E 78 | F8: Boiler sensor / Collector sensor (cascade) |
| E 80 | Room sensor HC1, F2: Buffer middle sensor |
| E 83 | Room sensor HC2,<br>F15: Pool sensor (Storage tank 3) |
| E 135 | F12: HW Storage tank bottom sensor, Multifunction 2 |
| E 136 | F13 (PT1000): HS2, Collector2, Multifunction 3 |
| E 137 | F14 (PT1000): Collector 1, Multifunction 4 |

When an error occurs in the heating system, the associated error number appears in the controller's display. Please refer to the table below for the significance of the displayed error code.
The system must be restarted after a fault has been remedied => RESET.

RESET : Brief device shut-off (mains switch). Controller restarts, reconfigures itself and continues to operate with the values that have already been set.

RESET the set values:
The overwriting of the set values with standard values can be performed separately in the "Service level" for the "User" and "Expert" parameters and the "Time Programs".

## *Troubleshooting*

### General

If your system malfunctions you should first check that the controller and the control components are correctly wired.

**Sensors:**
All sensors can be checked in the "General/Service/Sensor test" level. All the sensors that are connected must appear in this level with plausible measurements.

**Actuators (Mixer motor, pumps=>only with code no.):**
All actuators can be checked in the "General/Service/Relay test" level. All relays can be individually switched using this level. This makes it easy to check whether these components have been correctly connected (e.g. mixer motor direction of rotation).

**BUS connection:**
In control units with connection to
Mixer => Communication symbol appears in standard display ("⛈" or "⛈" depending on version) or at "Service / Communic MM 1"
HS controller => Displays the outside and the HS temperature (see "Display/Installation")
In HS controller with connection to
Control unit => Room temperature displayed and current room temperature setting blanked out "----" (see "Display/heating circuit")
In mixer expansion controllers with connection to
HS controller => Displays the outside and the HS temperature (see "Display/Installation")
Control unit => Room temperature displayed and current room temperature setting blanked out "----" (see "Display/heating circuit")

### In case of communication problems

Check connecting cables: Bus lines and sensor lines must be laid separately, away from mains cables! Poles switches?

Check bus feed: There must be at least 8V DC between the "+" and "-" terminals of the BUS connector [connectors 18+19]. If you measure a lower voltage, an external power supply must be installed.

### Pumps do not switch off

Check pump switching => Type of pump switching in the Expert level heating circuit

### Pumps do not switch on

Check operating mode => Standard 🕘 (test ✳)
Check time and heating program => Heating time
Check pump switching mode:
Default => Outside temperature > Room set temperature?
Heating limits => Outside temperature > Valid heating limit?
Room control => Room temperature > Temperature setting + 1K

### Burner does not switch of at correct time

Check minimum boiler temperature and type of minimum delimiter => Protect from corrosion

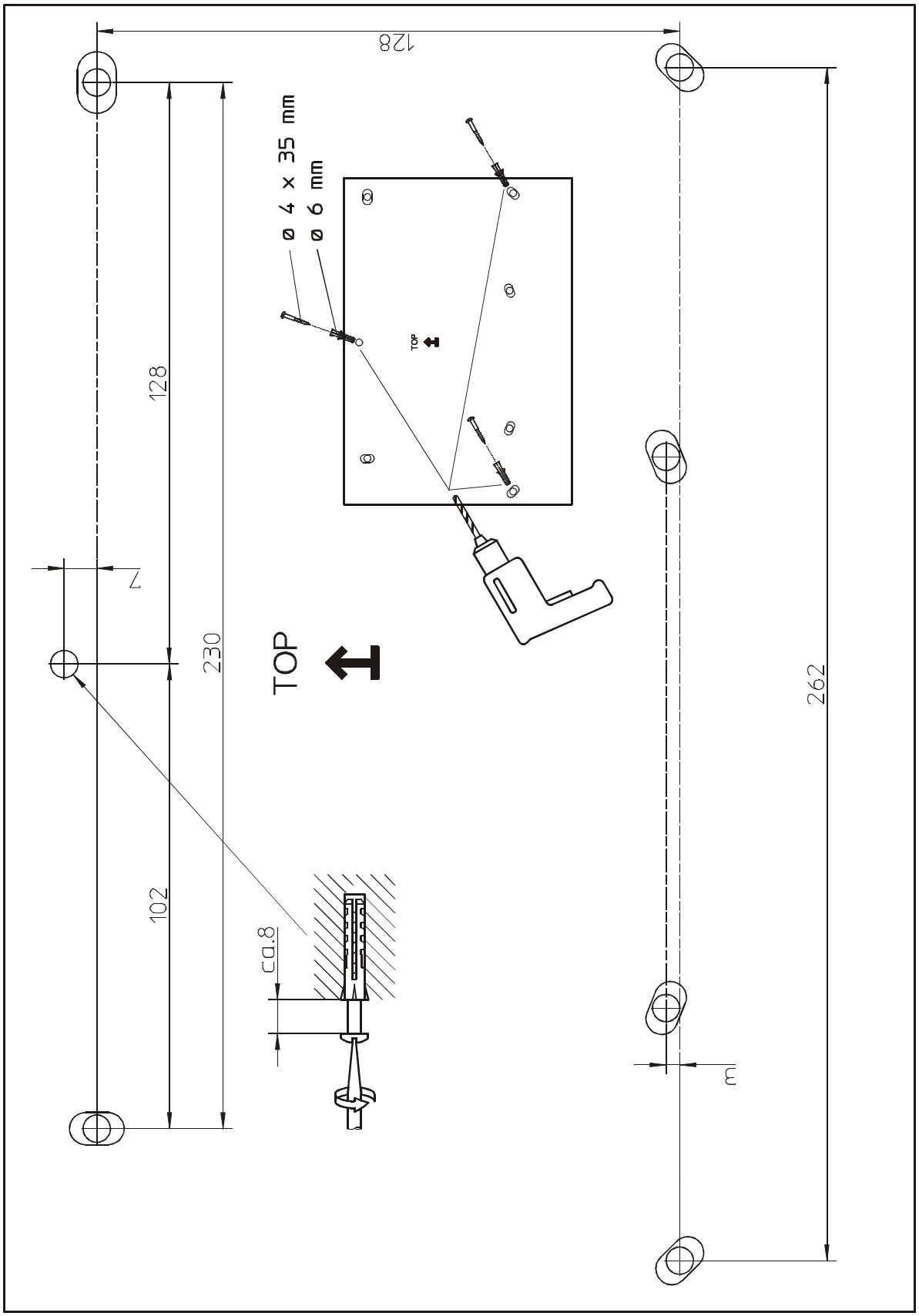
### Burner will not switch on

Check HS set temperature => The set temperature must be greater than the HS temperature.
Check operating mode => Standard 🕘 (test ✳)
With solar: Check burner blocking (BOB)

## ***Dimensions***

## ***Technical data***

| | |
|---|---|
| Supply voltage to IEC 38 | 230 V AC ± 10% |
| Power consumption | Max. 8 VA |
| Switching capacity of the relays | 250 V AC 2(2) A |
| Switching capacity of the Triac (A12) | 250V AC 1(1) A |
| Maximum current on terminal L1' | 6,3 A |
| Enclosure to EN 60529 | IP 40 |
| Safety class II to EN 60730 | Totally insulated |
| Power reserve of the timer | > 10 hours |
| Permitted ambient temperature during operation | 0 to 50°C |
| Permitted room temperature during storage | -20 to 60°C |
| Sensor resistances<br>Tolerance in ohms<br>Temperature tolerance<br><br><br>Tolerance in ohms<br>Temperature tolerance<br><br><br>Tolerance in ohms | NTC 5 kΩ (AF,KF,SPF,VF)<br>± -1% at 25°C<br>+/- 0.2K at 25°C<br><br>PTC 1010Ω (AFS,KFS,SPFS,VFAS)<br>± -1% at 25°C<br>+/- 1.3K at 25°C<br><br>PT1000 sensor with 1 kΩ<br>+/- 0,2% at 0 °C |




Malfunctions due to improper operation or settings are not covered by the warranty.

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